Mining CONGRESS JOURNAL

AMC

JUNE
1951



COAL CONVENTION REPORT NUMBER

What's NEW in Roof Bolting





PATTIN Has Designed a New Self-Centering Bolt Head and Protective Shell Tube.

THREE new improvements — each one helping to solve a packaging, shipping or installation problem—cut usual bolt handling and installation time up to 30%. Bolting crews can now be furnished with shipping bundles of 250 assembled bolts and shells containing 25 smaller bundles of 10 assemblies for easy handling—each shell covered with a protective tube, as shown above, to prevent damage to threads. It takes only a few seconds to remove the shell's protective tube and slip a plate washer (having a sufficiently large hole) over the shell and down the bolt to the new supporting bolt head that self-centers the plate washer on the head and it's then ready to be installed. Shipping—with bolt and shell assembled and with protective tubes covering the shells means—good bolt and shell thread fit—no lost parts—easier and quicker handling and installation—which mean savings in time and dollars. No special nuts or ears are needed on the bolts.

For safer roofs—hard or soft—the PATTIN expansion shell having double the usual shell expansion plus a 3-inch contact with the hole wall provides the strongest known anchorage for roof bolts. They are easy to install as no definite drilling depth is required and the shell can be anchored any place in the hole without turning while being tightened.

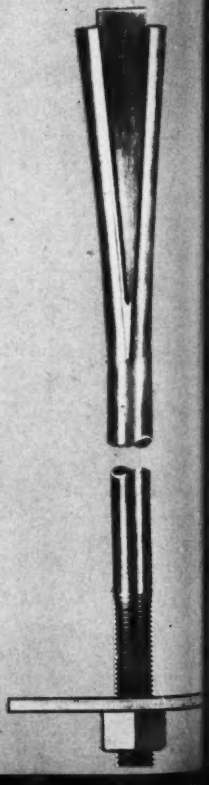
Patents Applied For

PATTIN'S New Self-Centering Bolt Head



THE PATTIN SPLIT TYPE BOLT, one of the first slotted bolts, continues to be a favorite wherever split type bolts are used. The bolt is a full 1-inch in diameter with cut threads and furnished with Hex or Square nuts and various size plates and wedges.

ALL MINING COMPANIES now bolting, experimenting or planning to roof bolt can depend on PATTIN shells and bolts for better anchorage and reduced time in bolting cycles. Our engineers are available for consultation and demonstrations. Write or phone us—we'll gladly work with you on any present or future bolting program.

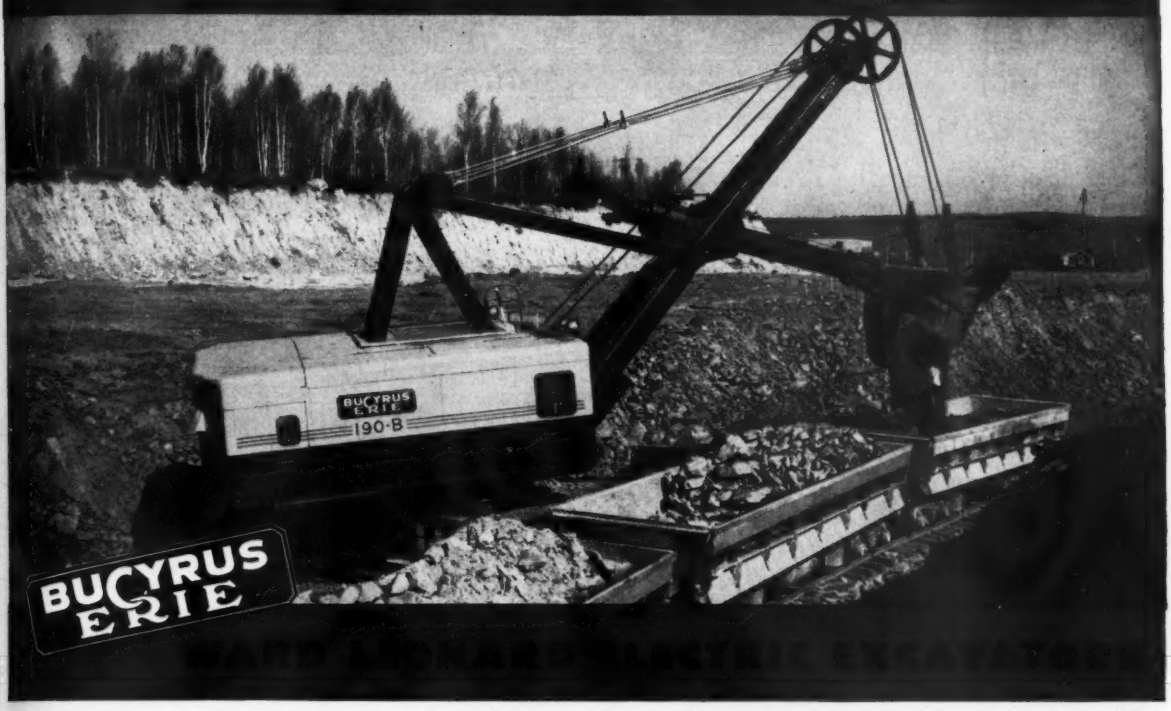


PATTIN MFG. COMPANY

"The Pioneer in Roof Bolting" Marietta, Ohio

EXTRA MARGIN

IN SHOVEL PERFORMANCE...



MORE OUTPUT even under the toughest conditions . . . more loads per shift in any quarry or mine . . . extra loads for that EXTRA MARGIN in performance . . . that's what you get from this exclusive combination of shovel front-end features:

1. **TWO-SECTION BOOM** provides maximum strength with minimum weight. The lower section is rigidly connected to the A-frame . . . takes the heavy stresses of the digging cycle in stride because it is part of the main machine.

2. **TUBULAR DIPPER HANDLE** is much lighter than equivalent two-member handle, yet equally strong. Its ability to rotate in the rubber-cushioned saddle block eliminates torsion during the digging stroke, minimizes shock loads.

3. **TWIN DUAL HOIST ROPES** assure a steady, positive digging action with automatic shift of hoist power to that part of the dipper lip where it is needed.

4. **INDEPENDENT ROPE CROWD** is simple, positive and quiet. Shipper shaft pinions and handle racking are eliminated. Crowd machinery is located on main deck rather than on boom — swing inertia is reduced, the operating cycle speeded up.

5. **QUICK CONVERTIBILITY** to dragline of the independent motor type. Hoist and drag functions are powered by separate motors, eliminating operating clutches and brakes.

These features — plus many more — make Bucyrus-Eries the finest heavy-duty excavators ever built: yard for yard, dollar for dollar, pound for pound. Write today for complete information on the 4½-yd. 110-B, the 6-yd. 150-B, or the 8-yd. 190-B.



7L54C

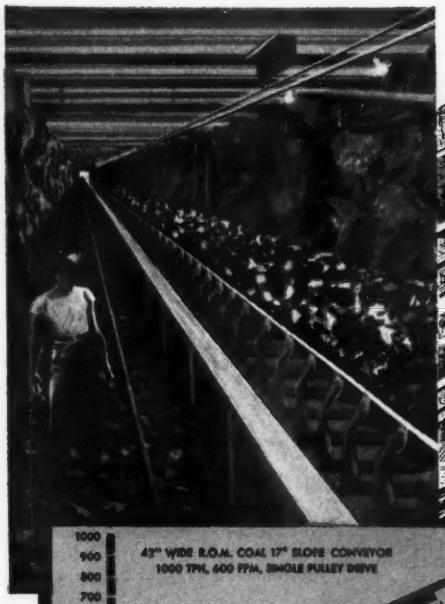
BREAKING THROUGH TO NEW HIGHS WITH THE NEW U. S. SUPER USTEX-N

for higher and higher lifts

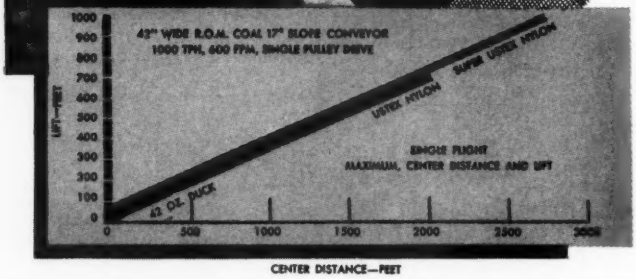
larger and larger tonnages

longer and longer centers

The high-strength belt for high-tension work
— — not affected by corrosion







ADDITIONAL FEATURES:

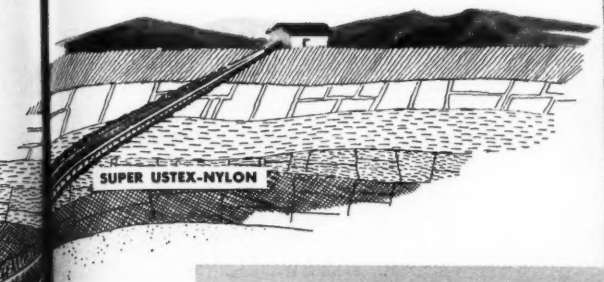
- Outstanding troughability.
- Easy training.
- High resilience dissipates shock and impact strains.
- Optimum elastic stretch.
- Homogeneous construction.
- High transverse strength, proper load support, resistance to longitudinal cu and tears, resistance to flexing fatigue.
- Low permanent stretch.
- High safety factor.
- Easy to splice— no special skills, techniques or materials requir
- Belt tension distributed evenly through entire carca
- A patented construction exclusive with United Sta Rubber Company.
- Mildew-inhibited.

US RUBBER

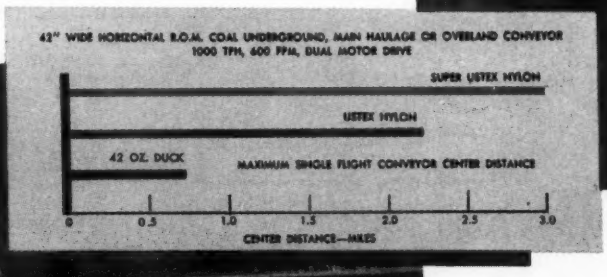
UNITED STATES RUBBER COMPAN

MECHANICAL GOODS DIVISI

X-NYLON BELT!







This great new Super Ustex-Nylon Belt is the latest in United States Rubber Company's parade of Belt Champions.

In 1929, "U. S." gave coal haulage a history-making lift—by presenting the 42-oz. duck belt, later to become standard in the industry.

In 1939, "U. S." came out with the strongest belt ever made up to that time—the famous 48-oz. duck belt. So strong was this belt that the first one installed is still in active service.

In 1948, still anticipating that in the years ahead mine operators would find it necessary to haul ever-increasing tonnage up higher and higher lifts, "U. S." introduced the Ustex-Nylon Belt—to handle the great tensions that were undreamed-of years before. In one mine alone, this belt cut haulage cost 50 cents per ton with 25% lower investment, and saved 6,000 feet of coal travel.

And now, in 1954, comes the latest champion, the Super Ustex-Nylon Belt, far stronger than even its illustrious predecessor. This great belt will carry record-breaking tonnages saving the coal industry additional thousands of dollars.

There is always a "U. S." sales engineer ready to work out haulage problems for you through Three-Way Engineering—the "U. S." method of working with mine engineers and the designers of conveyor equipment. Consult any of the 26 "U. S." District Sales Offices, or write to address below.

"U. S." Research perfects it... "U. S." Production builds it... U. S. Industry depends on it...

ROCKEFELLER CENTER, NEW YORK 20, N. Y.



"Save money? Sure!"

THAT, in a nutshell, tells you why so many wire rope users in the mines prefer Roebling wire rope... it speeds up operations... lasts longer on the job ...saves money that really adds up.

For the last word in wire rope efficiency and economy, call your nearest Roebling office or distributor for a Roebling recommendation.



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A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

JUNE, 1954

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Mining CONGRESS JOURNAL

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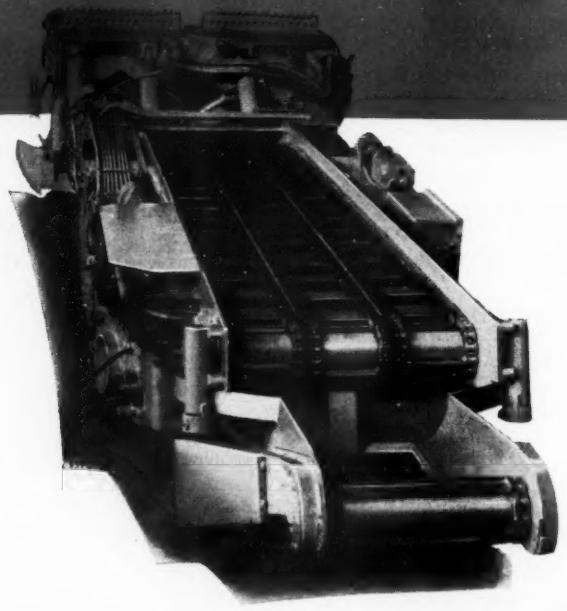
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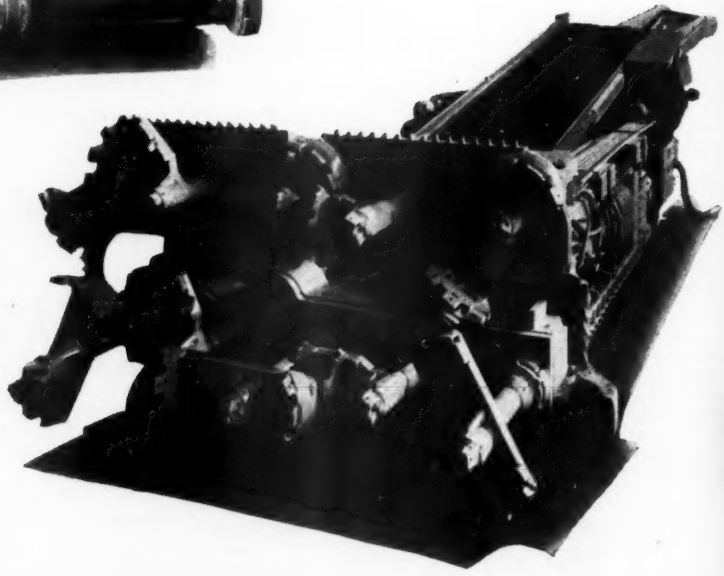
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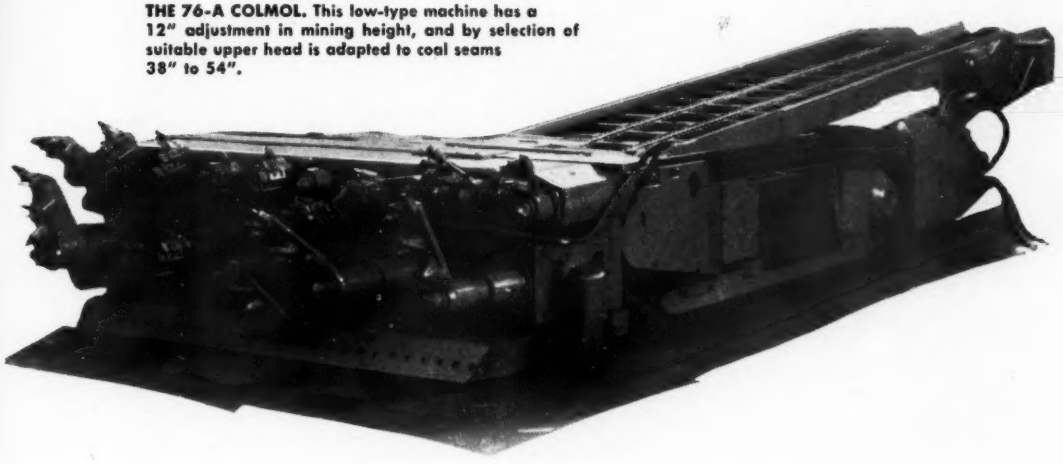
DISCHARGE END OF 76-B COLMOL. On this medium-high machine, the discharge conveyor will swing 31 degrees either side of center for easy loading of shuttle cars.



THE HUSKY 76-B COLMOL, medium-high type. Upper and lower heads, each with five arms, separate to adjust to different coal heights. Heads can be tilted as unit to follow rolls in bottom.

powerful • rugged • compact

JEFFREY COLMOL



THE 76-A COLMOL. This low-type machine has a 12" adjustment in mining height, and by selection of suitable upper head is adapted to coal seams 38" to 54".

The Jeffrey COLMOL is revolutionizing mining methods. It mines and loads in one operation, eliminating the use of explosives.

Built in low and medium-high types for seams 38" to 72", the COLMOL produces 35 to 80 tons per man-shift, depending on mine conditions. Under optimum conditions, a COLMOL recently mined more than 900 tons of raw coal in a single shift!

Such high productive capacity means low mining cost per ton. Maintenance costs are low too. Time is saved by combining mining and loading . . . eliminating the separate operations of cutting, drilling, shooting and loading.

Simplified controls make the COLMOL easy to operate . . . cut down on operator fatigue. Low RPM breaker arms, together with well-designed water spraying system, reduce dust hazard while COLMOL advances in seam.

Write for complete information and specifications.

THE JEFFREY MANUFACTURING CO.

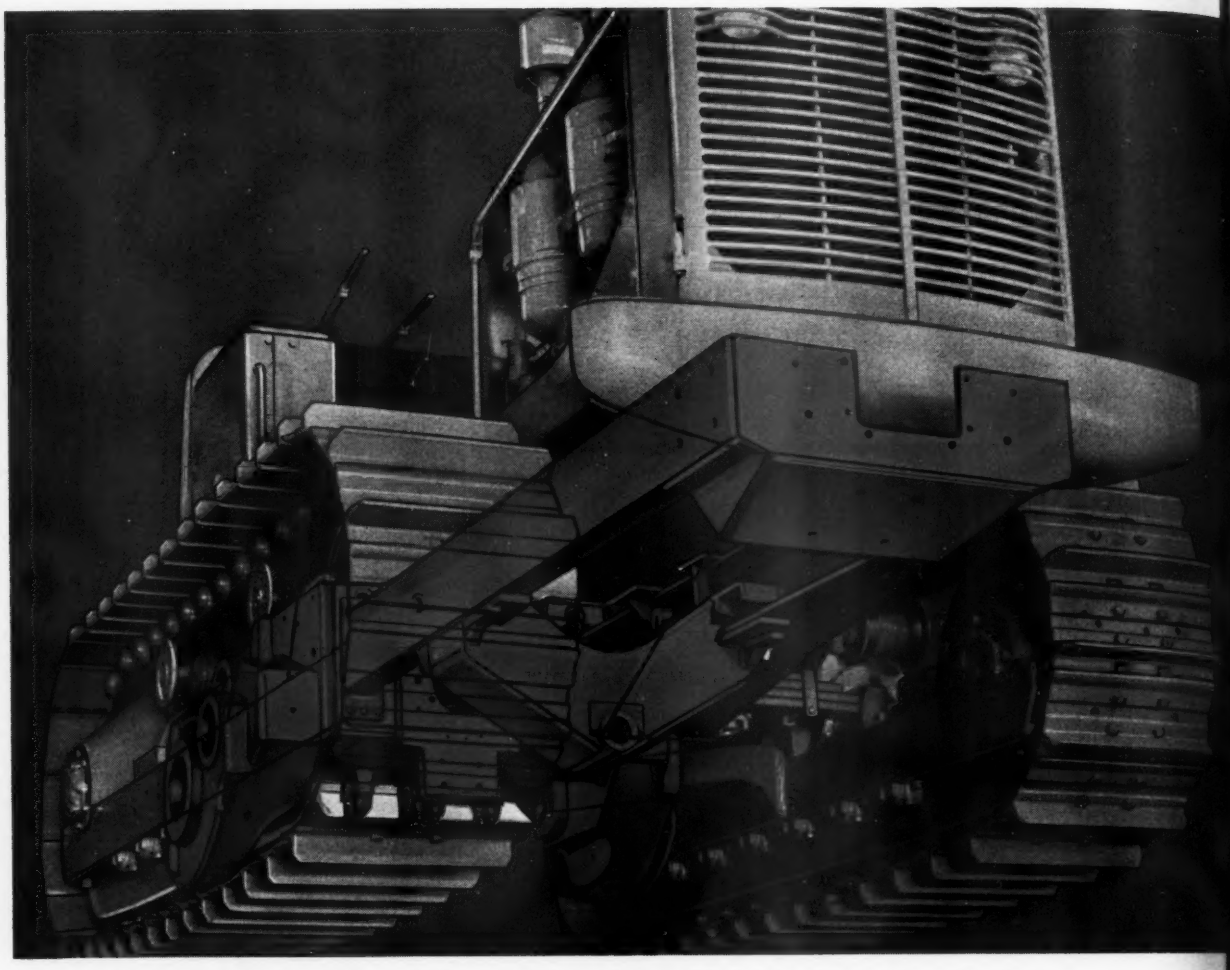
ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED
. . .IT'S A JOB FOR JEFFREY!



HOW THE MAIN FRAME CONTRIBUTES TO TOP TRACTOR PERFORMANCE

All-Steel Box A-Frame is a Key to Outstanding, Low-Cost Record of Allis-Chalmers Tractors

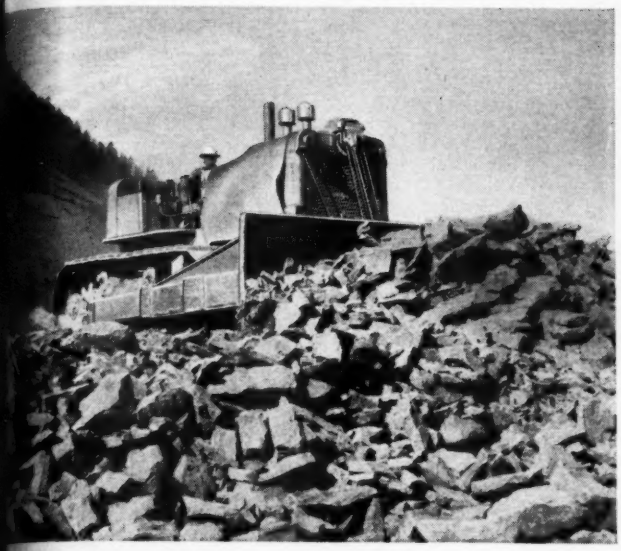
Mine operators everywhere are putting new emphasis on shrewd equipment buying. And rightly so. To increase production, stay on schedule and make a profit in the face of today's high costs, they have to be *sure* of getting top value in design, performance and service features.

More and more of these mine operators are now using Allis-Chalmers tractors. One of the big reasons is hidden in the heart of the tractor. It's the exclusive design which characterizes the main frames of all four Allis-Chalmers tractors. These frames are one-piece, all-steel, welded structual members (like the girders in a bridge or the columns in a building). They help provide greater strength and flexibility to withstand shock loads, better equipment mounting, improved weight distribution and outstanding service simplicity.

We invite you to see these advantages . . . first at your nearby Allis-Chalmers dealer, and then in a demonstration. Whichever size you may be interested in, you'll see a tractor that is not just modified . . . but designed new-from-the-ground-up to meet the needs of today's jobs.

ALLIS-CHALMERS

TRACTOR DIVISION · MILWAUKEE 1, U. S. A.



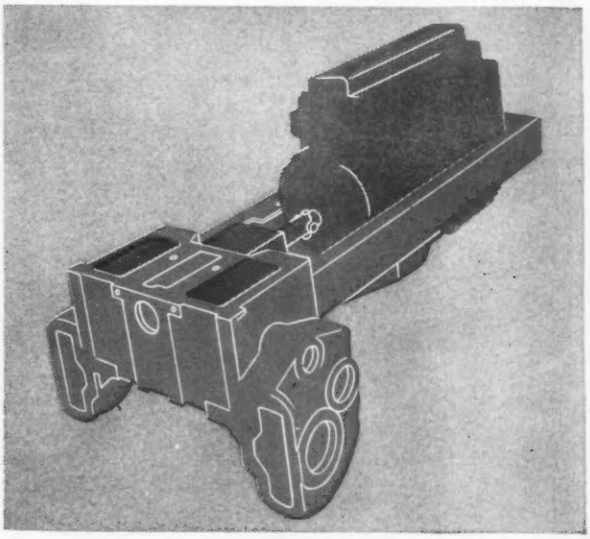
"Rolls with the Punch" — The resiliency of the high-tensile steel main frame enables it to flex slightly under extreme shock loads . . . without transmitting the strain to engine, clutch or transmission . . . thus offering extra protection to the complete machine.



Weight Distribution Designed for Today's Jobs— Box A-Frame lets Allis-Chalmers use a modern engine . . . locate main parts for best over-all balance . . . put more weight lower in tractor where it does the most good . . . make the tractor "built to take it."



Better Equipment Mounting — Designed to best serve changing tractor application (today over 70 percent of all tractor equipment is mounted), this compact main frame allows bulldozers to be mounted in close . . . provides ample clearance for equipment like front-end shovels . . . permits wide track shoes . . . improves performance of the entire unit.



Unit Construction for Service Simplicity — Since the main frame carries the *structural* load, power drive components are designed to do only their specific jobs. They can be readily removed, repaired or replaced without disturbing adjacent parts . . . saving service time . . . actually cutting down time because assemblies can easily be serviced under shop conditions if desired.

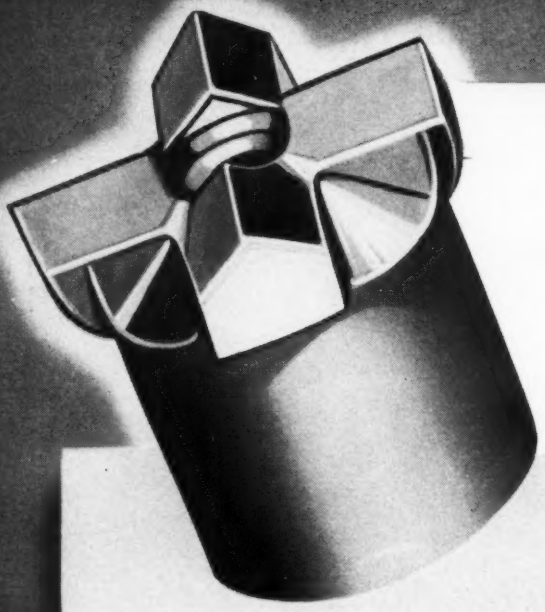
HD-20
Weight 41,000 lb
Hydraulic Torque
Converter Drive
175 net engine hp

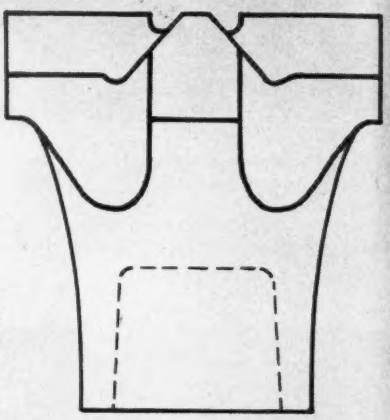
HD-15
Weight 28,000 lb
Choice of standard
transmission
or hydraulic
torque converter drive

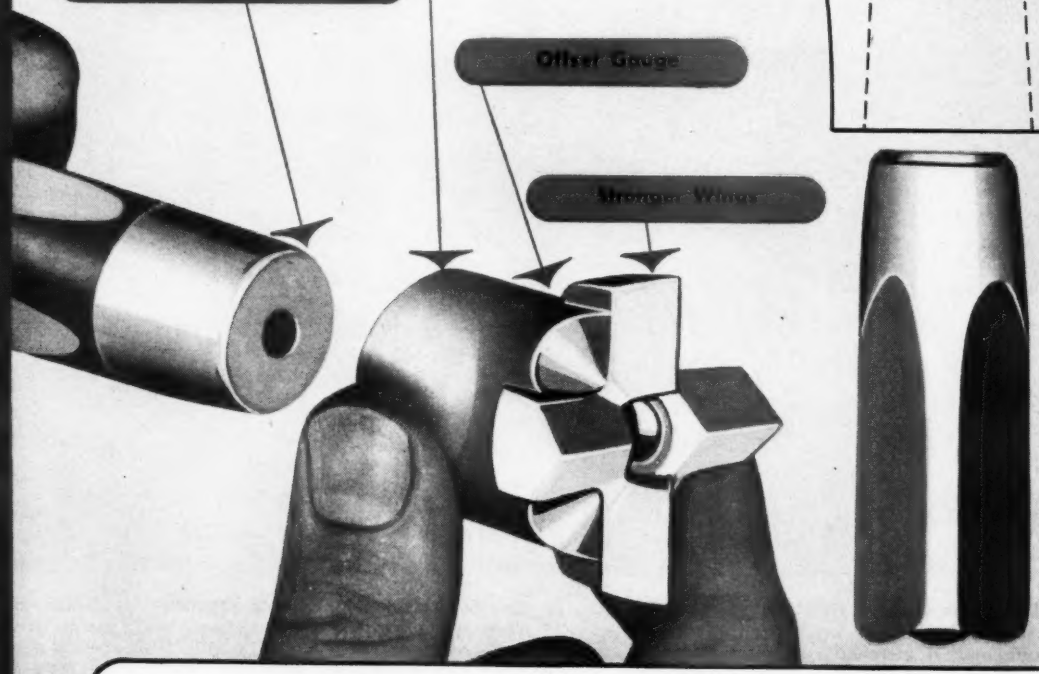
HD-9
Weight 18,800 lb
72 drawbar hp

HD-5
Weight 11,250 lb
40 drawbar hp

Here's another W







The union of the b... and the rod after ... ing has a calcul... strength of seve... tons . . . A sh... blow of sufficie... weight on the ... the bit skirt will ... to detach the bit ... the rod.

SPECIFICATIONS

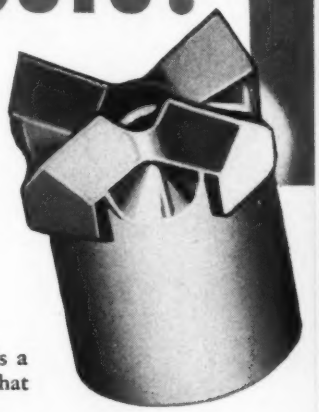
Mines everywhere cut drilling costs with CRD DETACHABLE DRILL BITS • 4 - Wing Type - Center Hole - Side Hole

Class "A" Bits For class "A" drill steel connection on any steel. Best suited to ⅞" steel.	1-1/4 1-5/16 1-3/8 1-7/16 1-1/2 1-9/16 1-5/8	Aluminum Pink Deep Green Brown Grey Maroon Deep Blue
Class "B" Bits For class "B" drill steel connection on any steel. Best suited to 1", 1⅛" and 1-¼" steel.	1-7/16 1-1/2 1-9/16 1-5/8 1-11/16 1-3/4 1-13/16 1-7/8 1-15/16 2 2-1/8 2-1/4	Orange Green Yellow White Black Red Blue Tan Plain Pink Maroon Aluminum

Cans are labeled showing size of steel socket, gauge of bit, and color.

er way to cut drilling costs!

Use Le Roi-CLEVELAND one-use CRD Detachable Bits





Lower cost per foot of hole — that's the goal of everyone who has rock to drill. And that was the goal of Le Roi-CLEVELAND engineers, too. They didn't fool around with the problem either. Fifty years of experience in designing rock drills was put to work. The result — a one-use detachable bit that can save you money in a wide variety of applications.

This designing job wasn't done overnight. You can't produce the results our engineers were after in such a short time. Instead, these bits were put to work—and, for a number of years they have helped reduce drilling costs materially in mines, in quarries, and on construction jobs.

That's why we offer them to you now — with complete confidence in their ability to help you improve your rock-drilling cost picture.

These Features Mean Lower Drilling Costs for You

Faster Drilling Speed — Special offset gauge feature, which permits the use of thinner wings and a steeper reaming angle, greatly reduces binding and provides ample clearance for cuttings. Result is a free, fast-cutting chiseling action that gives you greater drilling speed.

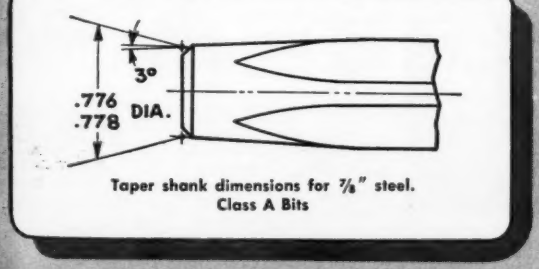
Less Drill-Steel Breakage — The method of attachment used with the CRD bit eliminates threads on the drill rod. Since a drill rod is only as strong as the root diameters of its threads, the tapered threadless CRD design provides longer drill-steel life — reduces drill-steel handling and reconditioning costs.

Lower Rock Drill Repair Costs — Because the CRD bit design reduces binding in the hole, there is less strain on the rotation parts of your rock drills. Rifle bars, rifle nuts, and chucks last longer. You get more drilling done at lower cost.

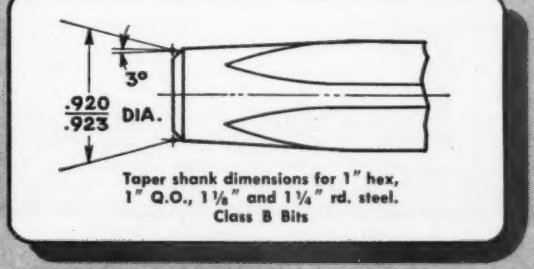
Since no special equipment is needed to thread rods, you owe it to yourself to try a can of CRD bits. They're ideal for roof bolting and for use in your stopes as well as in your headings. A short trial will give you first hand information on the ability of these bits to cut drilling costs in your property as they have in so many others.

Bulletin RD-29 gives detailed information. A copy is yours for the asking — just write for it. RD-58

CLEVELAND ROCK DRILL DIVISION
Le Roi Company
A Subsidiary of Westinghouse Air Brake Co.
12500 BEREA ROAD • CLEVELAND 11, OHIO
Plants: Milwaukee, Wis. • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Mich.



Taper shank dimensions for ⅞" steel.
Class A Bits



Taper shank dimensions for 1" hex, 1" Q.O., 1⅛" and 1¼" rd. steel.
Class B Bits

The taper attachment shank used with the CRD bit is easy to make. You need no dies or other expensive threading equipment. Several simple, low-cost methods can be used for preparation — grinding, forging or machining.

A "*FINER*" REDUCTION CRUSHER . . .
by the builders of SYMONS® CONE CRUSHERS



announcing the NORDBERG *Gyradisc*

. . . a REVOLUTIONARY MACHINE for the production of large tonnages of extremely fine product

FEATURES

■ **SOUND DESIGN AND CONSTRUCTION** . . . embodying proved reduction principles, ease of adjustment, and increased tonnage per horsepower.

■ **LARGE CAPACITY** . . . ideal feed is product containing material minus 1", ½", or ⅜", and fines. Close setting not required to produce large tonnage of fines.

■ **UNIQUE FEED ARRANGEMENT** . . . thorough mixing assured by compound action of feed plate gyration and rotation.

■ **EXCLUSIVE PNEUMATIC RELEASE MECHANISM** . . . reduces stresses—holds bowl structure rigidly to main frame. Automatic tramp iron protection. Provides immediate starting, even with crushing cavity full of material.

After years of extensive research and development, Nordberg now presents the *GYRADISC* . . . a new, revolutionary method of comminution that has been proved in the production of large tonnages of fine product in both metallic and non-metallic ore and mineral service.

The Nordberg *GYRADISC* is a unique combination of practical design features and original principles of operation resulting from Nordberg's background and long experience with successful crushing machinery, such as the world-famous SYMONS Cone Crusher. The Nordberg *GYRADISC* is as revolutionary in the reduction of large quantities of material to extremely fine sizes as the SYMONS Cone Crusher is in the realm of crushing.

For full details, send for your copy of the new *GYRADISC* Bulletin 228—just off the press.

NORDBERG MFG. CO., Milwaukee, Wisconsin

SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

NORDBERG MACHINERY

NORDBERG

SYMONS SCREENS NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG



Symons Gyratory and Cone Crushers





Mine Hoists



Symons Vibrating Grizzlies and Screens



Diesel Engines



Left: Standard Coring Bit, for best results in hard, firm, rock.
Center: Impregnated Coring Bit, for best results in broken or extremely abrasive rock.
Right: Series "M" Coring Bit, for maximum core recovery from coal or fragile rock.

for Faster Drilling and Better Cores at Lowest Cost Per Foot

"ORIENTED DIAMOND BITS"

Besides pioneering the development of Oriented Diamond Bits (in which each individual diamond is set with its hardest edge or "vector" toward the work) we have proved, through extensive comparative tests in our own contract drilling operations, that they cut much faster and last much longer than bits in which the diamonds are set at random.

In terms of footage cost these are the most economical diamond bits ever produced and we are furnishing them NOW at no advance in price. Bulletin 320 illustrates and describes all types and gives complete working data.

HIGH-SPEED DRILLING MACHINES

Our wide line of high-speed diamond drilling machines meets every requirement for both core drilling and blast-hole drilling at minimum expense—measured by the results achieved. Modern design, rugged construction, anti-friction bearings and heat-treated alloy-steel wearing parts permit long periods of continuous high-speed operation under the most difficult conditions. Illustrated bulletins, containing complete specifications and working data, mailed on request.



COMPLETE ACCESSORY EQUIPMENT

To meet the requirements of our own contract drilling crews, we are obliged to supply a wide variety of accessory equipment and to carry all commonly-used items in stock for immediate delivery. The same prompt service is available to other diamond drill operators and ordering is made easy by a 28-page catalog which gives all necessary information—including illustrations, piece numbers, weights and code numbers, for ordering by wire or cable. Every operator of a diamond drilling rig should have a copy of Bulletin 31-F and we'll send one free of charge.

WORLD-WIDE CONTRACT DRILLING

For more than sixty years, Sprague & Henwood, Inc. has been a leader in the field of diamond core drilling by contract. During this long period, our crews have completed thousands of contracts successfully, in practically every corner of the globe. Besides exploratory drilling for coal and ore, our service includes foundation-test drilling, grout holes and pressure grouting. Correspondence is invited regarding any diamond drilling job—anywhere. Estimates on request.



SPRAGUE & HENWOOD, INC.

NEW YORK, N. Y.
PHILADELPHIA, PA.

SCRANTON 2, PENNA.

PITTSBURGH, PA.
GRAND JUNCTION, COL.



SPECIFY FIRST . . . REPLACE LAST

AMSCO DIPPERS FOR MINES

Mine superintendents with years of on-the-job experience, regularly specify manganese steel dippers on new equipment. Most specify by name—Amsco.

The reason is obvious. Amsco manganese steel dippers will stand up longer under rugged mine treatment and down time will be cut to a minimum.

Next time you order a power shovel or replacement dipper, specify long life right on your purchase order . . . *specify an Amsco manganese steel dipper.*

AMERICAN Brake Shoe COMPANY

AMERICAN MANGANESE STEEL DIVISION
Chicago Heights, Ill.

HEYL & PATTERSON RESEARCH GOES BEYOND THE LABORATORY... to serve you



Heyl & Patterson Research Engineers R. M. Sheaffer and F. M. Rafferty gather samples for analysis from the underflow of Heyl & Patterson 3" Cyclones at a large coal preparation plant which is operating on a closed circuit. Field testing of installed equipment is an integral part of the Heyl & Patterson service.

The Heyl & Patterson Research Department exists primarily for one purpose . . . to work with you to find the best solutions to your coal preparation problems.

Experienced H & P Research Engineers spend much of their time in the field . . . moving from plant to plant either to investigate new problems or to keep a finger on the operating performance of equipment previously installed.

Today numerous preparation plants operate on closed circulating water circuits as a result of installing equipment recommended by H & P engineers. Several other large plants are currently being studied to obtain the same results.

An increasing number of coal operators call on H & P engineers because they know that recommending coal preparation equipment is not guesswork with Heyl & Patterson. It is the end result of precise investigations and expert engineering, backed by years of practical experience.

The H & P method is proved, the findings are accurate and the cost is nominal. When you have coal preparation problems . . . call on H & P Research Engineers to determine the accurate answers.

Cyclone Thickeners
Thermal Dryers
The Drying Dutchman
Reineveld Centrifugal Dryer
Thorsten Coal
Sampling Systems
Rotary Mine Car Dumpers
Coal Crushers
Coal Preparation Plants
Bradford Breakers

Heyl+Patterson, Inc.

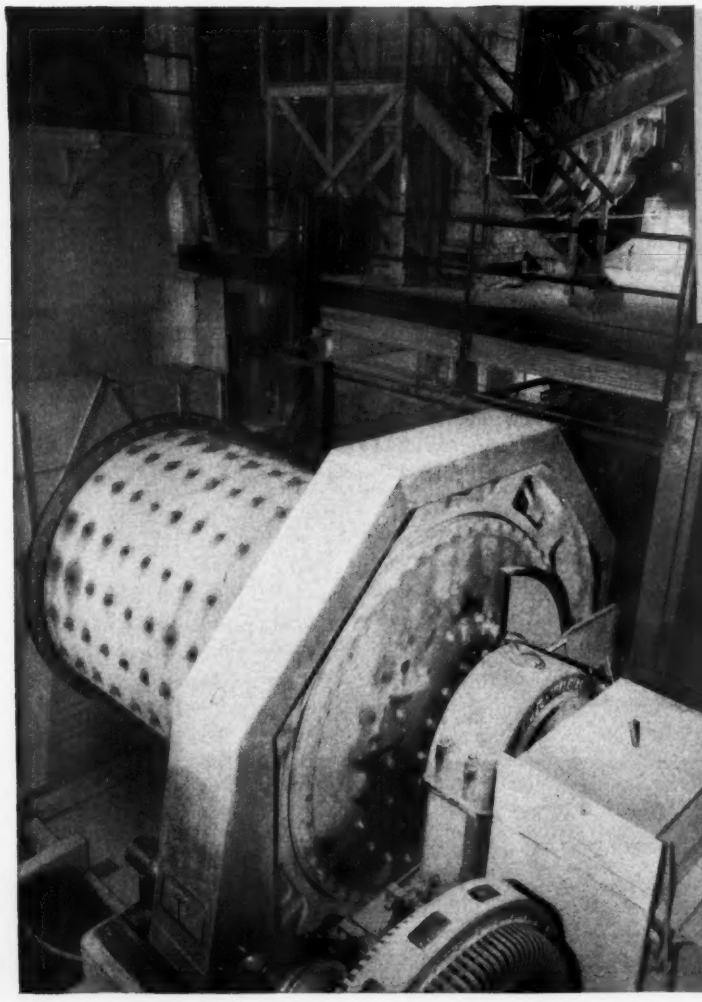
"SINCE 1887"

55 FORT PITT BLVD. PITTSBURGH 22, PA.

Here's How
INDUSTRY'S TOP TECHNICAL
Helps Grinding Mill Operators



HELPS PLANT AND CONSULTING ENGINEERS — Here's the way it works. Let's suppose you are building a new concentrator and you want information and recommendations on crushing, grinding, screening, process flow and equipment needed. Allis-Chalmers specialists, familiar with the process problems involved, work with your engineers to provide a solution.





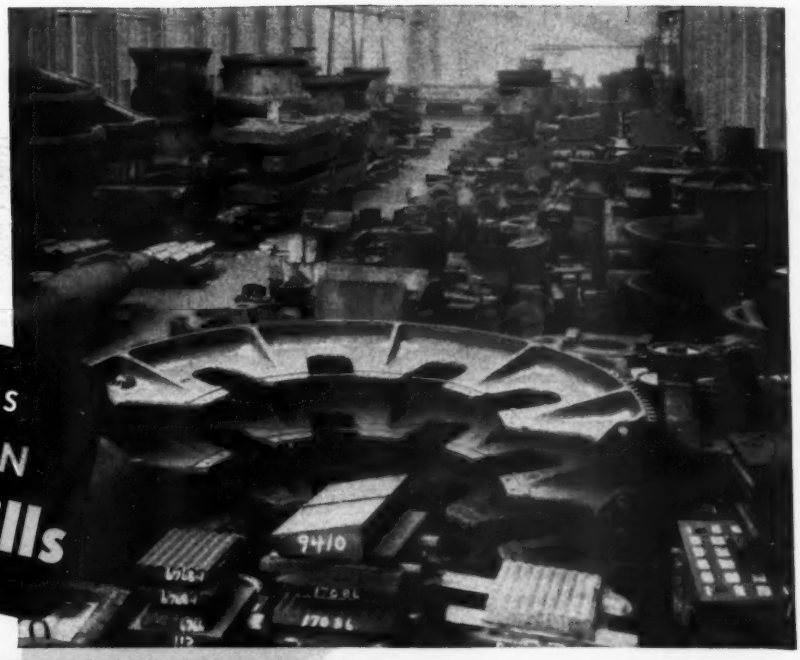
TESTS ORE SAMPLES — Ore samples are sent to the A-C laboratory for crushing, grinding, screening and additional tests to determine the equipment and process best suited to produce the desired end product. This laboratory is one of the best-equipped, best-staffed in the country. View of a section of the pilot grinding mill is shown.

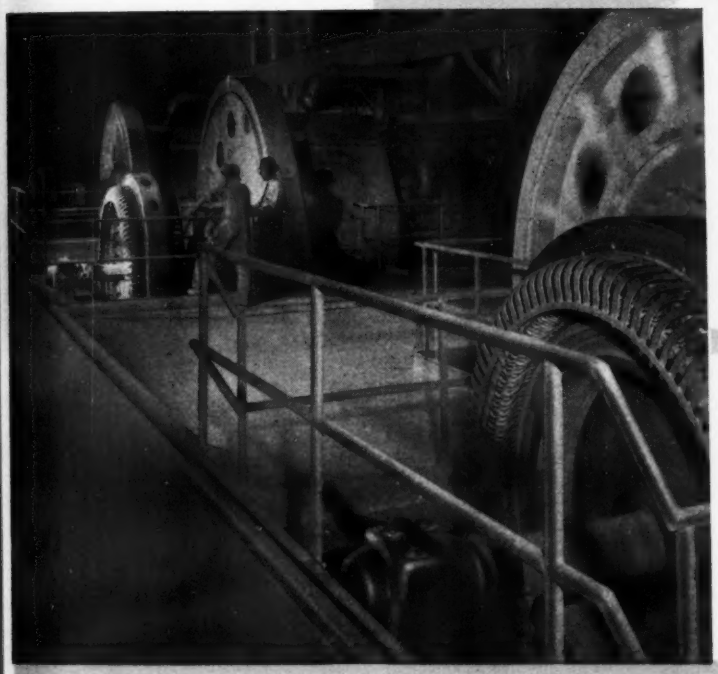
FURNISHES INFORMATION ON PROCESS FLOW AND EQUIPMENT — From lab test information and wide experience gained in solving similar problems, a flow sheet and a list of needed equipment are worked out. In the plant shown here, Allis-Chalmers recommended and furnished the rod and ball mills.

ALLIS

TEAM

ALLIS-CHALMERS
PROGRESS IN
Grinding Mills





PROVIDES CONTINUOUS SERVICE — When maintenance is necessary, a telephone call will put another A-C team to work on your problem. Complete records are kept on every Allis-Chalmers grinding mill. If parts are needed, these records are checked, and *exact* duplicate parts are speeded to you. Your nearest A-C District Office is always ready to help you. One section of the tremendous inventory of parts stocked at A-C is shown in this photo.

A COMPLETE PLANT OR A SINGLE MACHINE—Because Allis-Chalmers builds many types of equipment . . . crushers, grinding mills, screens, washers, kilns, coolers as well as the electrical power generating equipment, motors and controls, they can furnish a whole plant or a single machine. Allis-Chalmers offers the advantage of undivided responsibility for the complete process and equipment package.

AN ALLIS-CHALMERS TECHNICAL TEAM is always ready to work with your plant or consulting engineers on your grinding or processing problems. To take advantage of their services, call your nearest Allis-Chalmers District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4292

ALLIS-CHALMERS EQUIPMENT FOR THE MINING AND ROCK PRODUCT INDUSTRIES

Crushers, all types — Vibrating screens, all types — Kilns — Coolers — Washers — Dryers — Smelting equipment

CHALMERS

A-C ALLIS-CHALMERS

SIMPLICITY PAYS!



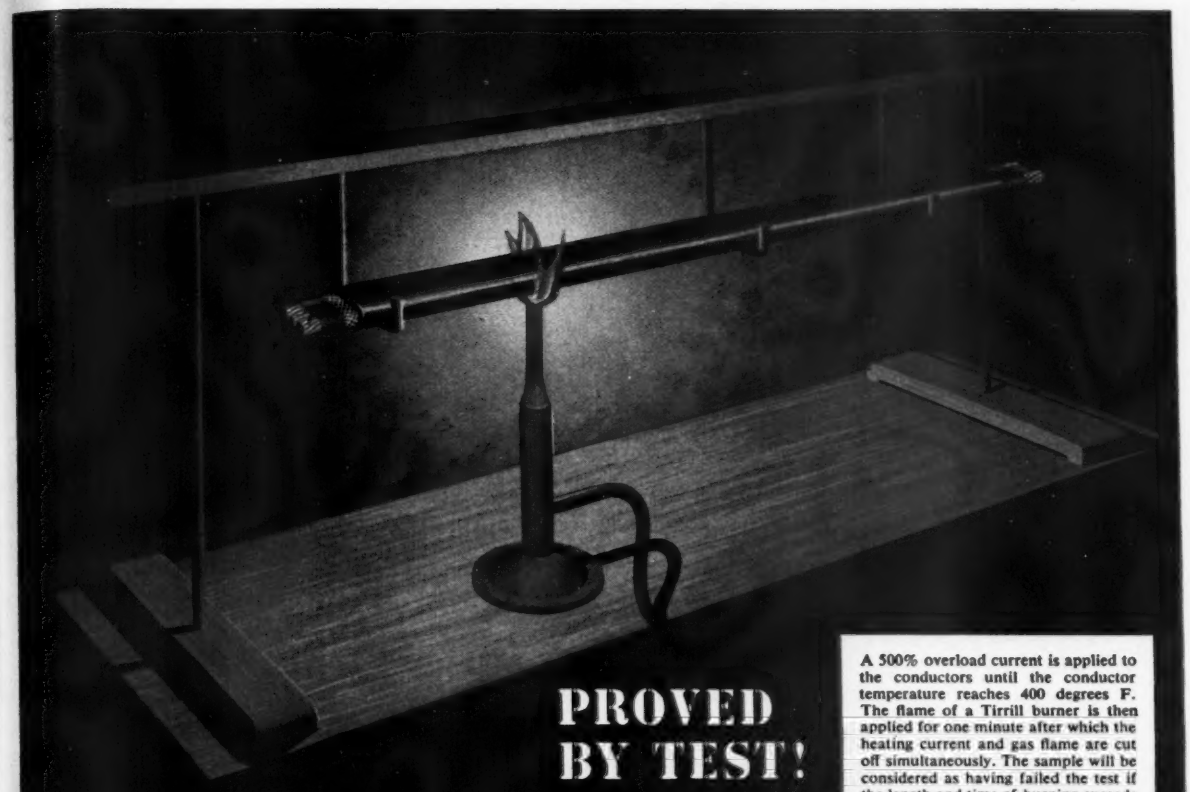
That's the secret of the standing success of the a.c.f. Mine

From the operating viewp they're simplicity itself—they move when and where you want them, unlo the rate of a ton-a-second because o specially-designed drop bottom actio

From the maintenance viewp they're simplicity itself—a damaged c be shunted to a siding and produ keeps rolling. Your own men can h most repairs right on the spot.

Why settle for less than the economical mine transportation yo buy? See your a.c.f. Representative American Car and Foundry Company, York • Chicago • St. Louis • Cleve Philadelphia • Huntington, W. Va. Francisco • Washington • Berwick, Pa

a.c.f. **MINE CARS** *for Constant Haulage*



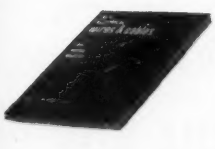
PROVED BY TEST!

A 500% overload current is applied to the conductors until the conductor temperature reaches 400 degrees F. The flame of a Tirrill burner is then applied for one minute after which the heating current and gas flame are cut off simultaneously. The sample will be considered as having failed the test if the length and time of burning exceeds 6 inches and 5 minutes respectively.

Flame-Retardant

U. S. Royal Mine Trailing Cables





Write for free illustrated booklet, "U. S. Electrical Wires and Cables for the coal mining industry."

Ordinary coal mine trailing cables – when ignited by either mechanical injury or overload – will propagate flame and may carry the fire to other sections of the mine. *But not U. S. Royal Cables!* They are jacketed with a special flame-retardant 60% neoprene compound which also withstands cutting, chipping, abrasion, grease and oil. Performance grade rubber insulation is used up to 2000-volt service. Cables for over 2000-volt service are insulated with Uskorona-1 oil base insulation and have a semi-conducting tape over the conductors.

U. S. Royal gives "Service beyond price and specification" because United States Rubber Company is the only electrical wire and cable manufacturer to grow its own natural rubber, make its own synthetic rubber and plastics. Such control of the manufacturing process results in a *quality* product. Available in black, or gold for better visibility.

UNITED STATES RUBBER COMPANY
ELECTRICAL WIRE AND CABLE DEPARTMENT, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

US RUBBER



Biting into raw iron...

Two years of tough, schedule-smashing construction by the men of Morrison-Knudsen Company made possible the first shipment of ore from Venezuela's Cerro Bolivar, for the United States Steel Corporation.

To reach the ore deposits, a 91-mile railroad and an 80-mile highway had to be constructed. A monthly average of 400,000 cubic yards of earth and rock was moved to prepare the railway grade alone. Part of the way, excavation was almost entirely in double-extra-hard granite, with a crushing strength of 60,000 psi. And on the southern slope of Cerro Bolivar itself, scores of side-hill cuts were made through hard layers of solid ore that graded 65% or more pure metal.

This was a job that demanded an exceptional combination of engineering skill, determination, and the best of construction and drilling equipment... that's why Crucible Hollow Drill Rods were chosen. For *lowest cost per foot of hole drilled* specify Crucible Hollow Drill Rods.



Crucible Hollow Drill Steel in machines like this one bite into ore on Cerro Bolivar.



One of the men who helped make the project possible — C. Dugan Graham, vice-president of M-K de Venezuela, and project manager in charge of the job.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS





Allis-Chalmers Tractor Shovels

bring new flexibility to mining operations

ALLIS-CHALMERS offers a complete line of time-tested Tractor Shovels to mechanize mining operations in a new, better way . . . four sizes with standard bucket capacities from one to four cubic yards. These units bring year-round, time- and money-saving advantages on a wide variety of the toughest mine jobs . . . loading, stockpiling ore; handling sand, gravel and other bulk materials; cleaning up around hoppers, conveyors, shovels; building access roads; maintaining tailing dumps; digging, lifting, dozing and grading on many other mine jobs.

Important advantages include: more track on the ground for better stability, traction and flotation . . . truck wheels, support rollers and idlers that require lubrication only once every 1,000 hours . . . all-steel welded construction to withstand the shock and strain of tractor-shovel work . . . simplified hydraulic system for shovel control . . . lugability that assures unfaltering performance . . . minimum service requirements.

In addition, buckets for light materials, rock buckets, lift forks, bulldozer blades and other quick-change attachments are also available.

The Allis-Chalmers dealer in your area will gladly discuss earth-moving and Tractor Shovel applications with you.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



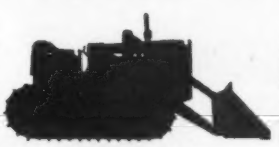
HD-5G

40 drawbar hp
Weight — 16,200 lb
Standard Bucket Capacity — 1 cu yd
Dumping Height — 9 ft, ½ in



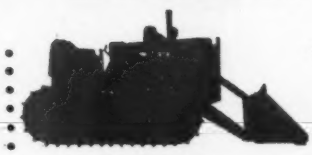
HD-9G

72 drawbar hp
Weight — 29,900 lb
Standard Bucket Capacity — 2 cu yd
Dumping Height — 11 ft, 4 in



HD-15G

109 drawbar hp
Weight — 47,580 lb
Standard Bucket Capacity — 3 cu yd
Dumping Height — 11 ft, 7 in
With Torque Converter Drive
135 net engine hp
Weight — 48,030 lb

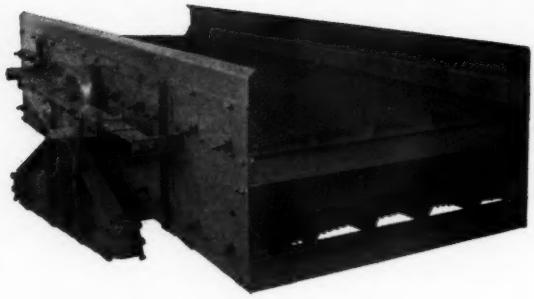


HD-20G

175 net engine hp
Torque Converter Drive
Weight — 63,325 lb
Standard Bucket Capacity — 4 cu yd
Dumping Height — 12 ft, 10 in

HEWITT HR ROBINS can cut your handling costs with this complete

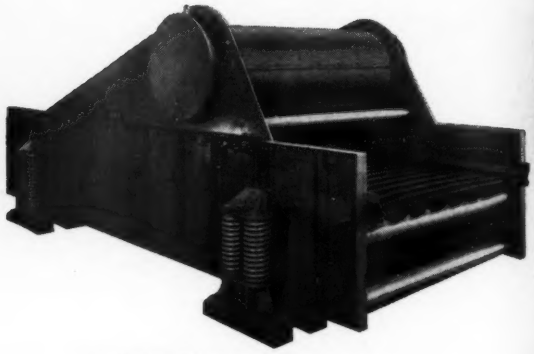
FOR SCREENING



GYREX°

Positive Stroke 4-Bearing Screens

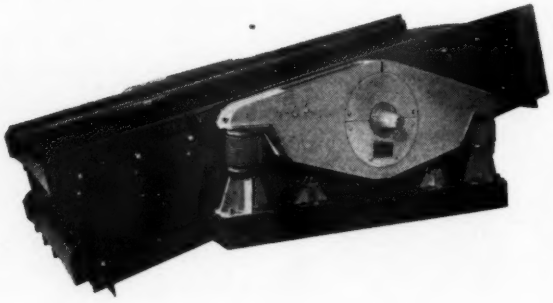
STROKES: ¼" at 1,000 r.p.m. and ½" at 625 r.p.m.
SIZES: Complete range of standard sizes from 48" x 78" to 72" x 192".
DECKS: Single—Double—Triple.
MOUNTINGS: Anvil-type cast iron base with *exclusive angle adjustment* for floor mounting—Steel I-beam base for suspended or rigid mounting.



ELIPTEX°

Horizontal Operating Flat Screens

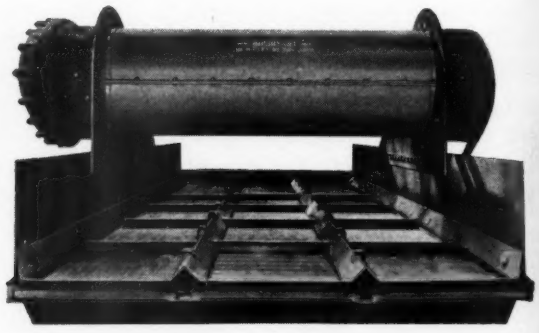
STROKES: 7/16" nominal at 1,000 r.p.m.—Other stroke and speed combinations available to meet special applications.
SIZES: All standard sizes from 36" x 96" to 72" x 240".
DECKS: Single—Double—Triple.
MOUNTINGS: Floor mounted or Suspended arrangement.



VIBREX°

Full-Floating, Unbalanced Pulley-Type 2-Bearing Screens

STROKES: Available in many stroke and speed combinations ranging from ⅛" at 1,800 r.p.m. to ½" at 660 r.p.m. —All Vibrex screens have readily adjustable stroke to meet the most exacting operating conditions.
SIZES: All standard sizes from 16" x 30" to 72" x 192".
DECKS: Single—Double—Triple.
MOUNTINGS: *Exclusive angle adjustment* for floor mounting —Cable arrangement for suspended mounting.



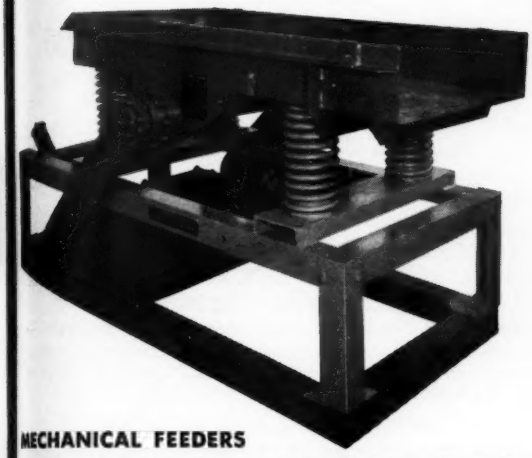
ELIPTEX DEWATERIZER

Specially Designed Eliptex Screen With Micron-Size Opening Stainless Steel Flat Rod Deck

STROKE: Extra-full stroke operating at high speed for maximum efficiency to handle even the most difficult dewatering problems.
SIZES: All standard sizes from 36" x 144" to 72" x 192".
DECKS: Single—Double.
MOUNTINGS: Same as Eliptex Screens.

line of Vibrating Equipment

FOR FEEDING & CONVEYING



MECHANICAL FEEDERS

A *fully mechanical* vibrating feeder that is easily maintained by your own personnel. Extremely high capacities at very low power consumption.

FEED CONTROL: Remote, wide range, variable speed controls available.

STROKE: Full 3/16" at 1,000 r.p.m. readily adjustable . . . ideal for handling material of varying characteristics.

SIZES: All standard sizes from 24" x 48" to 48" x 96".

MODELS: Standard—Heavy duty models and special pans and deck designs available . . . suspended or base mountings.



VIBRATING CONVEYORS

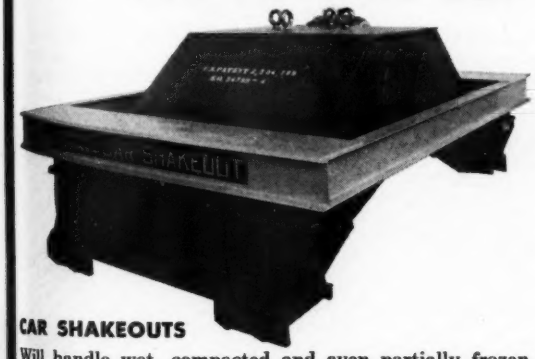
A continuously balanced vibrating conveyor offering longer units with higher capacities at lower horsepower than ever before available. Ideal for handling a wide range of materials be it wet or dry, lump or pulverized, packaged or loose, hot or cold, abrasive or corrosive.

SIZES: Standards from 8" to 48" wide up to 150′ long with single drive.

STROKE: Full strokes from 1/4" to 3/8" at speeds of approximately 750 r.p.m.

MODELS: Standard—Heavy duty models and special pan designs and arrangements available.

FOR SHAKING OUT



CAR SHAKEOUTS

Will handle wet, compacted and even partially frozen loads. Capacities vary depending upon characteristics of material . . . Typical unloading time under 5 minutes per car.

MODELS: 5-Ton HD (Heavy-Duty) for handling up to 100 cars per day—3½-Ton GS (General Service) generally recommended for up to 10 cars per day. Both models available with companion twin-hook Car Shakeout Hoist.

STROKE: 5/32" at 1,500 vibrations per minute (easily adjusted for specific applications).

Patent No. 2,504,789



FOUNDRY SHAKEOUTS

Successfully used in steel, iron and non-ferrous foundries of all types (production and jobbing) handling castings weighing from a few ounces up to 60 tons.

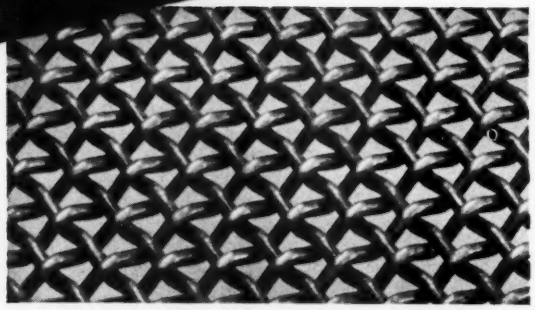
SIZES: From 2′ x 2′ to 8′ x 10′ in single units. Multiple unit arrangements up to 16′ x 33′.

CAPACITIES: Up to 300,000 # (150 tons) in multiple units.

STYLES: Standard Stationary, Portable, Gravity Self-Discharging and Mechanical (Horizontal) Self-Discharging.

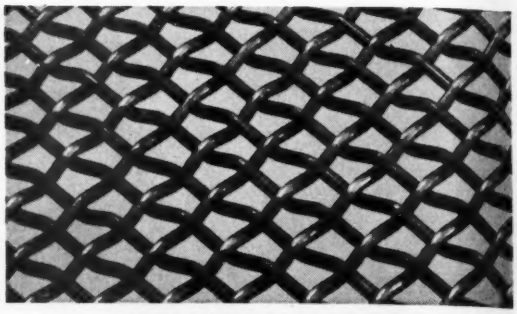
AND FOR YOUR SCREEN CLOTH NEEDS

HEWITT HR ROBINS can cut your handling costs with a complete



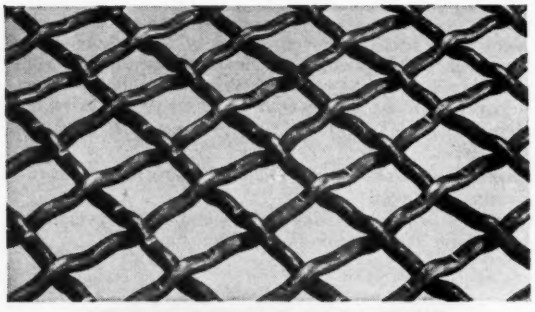
SQUARE OPENING DOUBLE CRIMP

All wires are specially crimped so that a spring tension permanently locks them together at each intersection. This guarantees tightness of weave and accurate sizing because openings cannot vary.



RECTANGULAR OPENING

Recommended for high speed sizing where accuracy is secondary. Rectangular weave provides greater open area hence higher capacity. Furnished with double crimp or flat top weave.



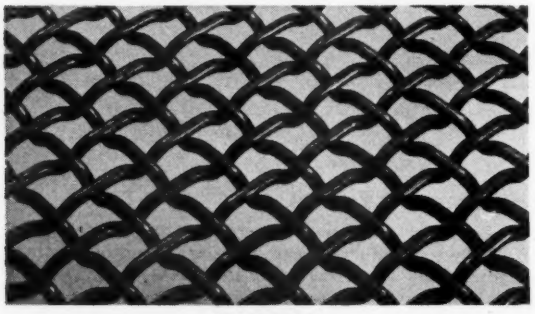
SQUARE OPENING LOCK CRIMP

Ideal for scalping. Has additional crimp to lock wires together under pressure to prevent wires from shifting as a result of impact and handling of oversize materials.



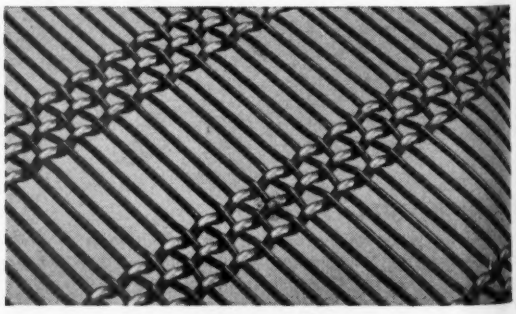
NON-SPREADER

Best for high speed sizing of coarse materials. Heavy-duty wires assist in maintaining accuracy of opening even under impact of wedge-shaped stone and over-sized materials.



FLAT TOP

Crimp characteristics provide smooth screening surface. Absence of high spots, as in other types of crimp, permits free flow and reduces abrasive action of material. Assures longer wear, faster screening and less degradation.



NON-BLIND

Recommended for processing moisture-laden materials that plug or blind openings. Slotted openings kept free from blinding due to secondary vibration set up in longer span wires. Clustered wires carry heavy tension and are crimped to maintain width of opening.

...ine of Screen Cloth

Each Type of Hewitt-Robins Screen Cloth is Specially Engineered To Accurately Size Large Tonnages... Last Longer... Cut Your Screening Costs

Hewitt-Robins Screen Cloth guarantees overall sizing accuracy through precision-weaving of individual screen cloth wires. You get longer service because Hewitt-Robins utilizes a full range of metals in its selection of wire to assure that each panel of screen cloth is matched to meet individual job requirements. Types of wire range from genuinely oil-tempered through spring steel, stainless steel, enamel-coated and on to special alloys of extraordinary corrosion and heat resistant properties.

In specific installations where the more abrasive materials such as coke, iron ore, stone, gravel and coal are handled, specify Hewitt-Robins Super-Gyraloy. It's the specially treated oil-tempered wire that combines hardness—stiffness—elasticity—ductility—toughness... and must pass exacting laboratory tests for uniformity of these properties.

For operations involving a dust factor aggravated by moisture (as in sizing fine coke and iron ore) specify Hewitt-Robins Super-Gyraloy Enamel Coated Screen Cloth. The enamel coating prevents the build-up of the blinding compound . . . protects the surface against moisture and averts oxidation of the metal.

Where initial cost is of primary consideration and abrasion is not excessive, Hewitt-Robins Gyraloy® spring steel screen cloth provides maximum efficiency and economy. For special applications Hewitt-Robins Screen Cloth comes in plain or galvanized steels, brass, phosphor-bronze, Monel and other ductile alloys.

Hewitt-Robins Screen Cloth is available in standard production size openings from 3/16" and coarser . . . wire sizes from .105" diameter up to and including 1" diameter.

For complete information regarding the kind, type and opening of Hewitt-Robins Screen Cloth to best fit your operation . . . give you highest screening efficiency at lowest cost per ton . . . contact Hewitt-Robins Incorporated, Robins Conveyors Division, 270 Passaic Avenue, Passaic, New Jersey, or your nearest Hewitt-Robins representative.

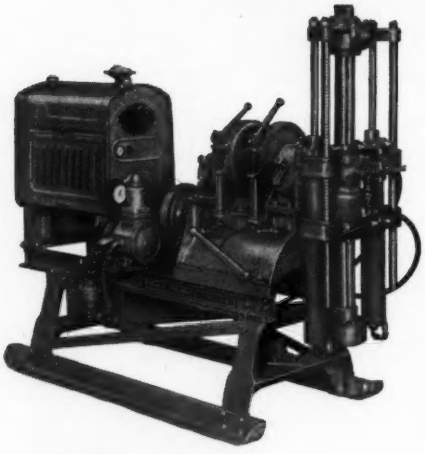
HEWITT (HR) ROBINS

Executive Offices, Stamford, Connecticut

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam

FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

FOR EXPLORATORY DRILLING



Whether you're mineral prospecting or endeavoring to delimit existent bodies, you'll wind up with the right information easier and faster by using the skid-mounted CP-8 and CP-15 Diamond Core Drills. Specifically engineered to withstand the continued high drilling speeds made possible by bortz bits, they're available with gas, diesel or electric drive for surface drilling and air drive for sampling underground. And they can be readily moved from hole to hole under their own power. Bolted frame permits easy disassembly for transportation to remote sites. With E-EX fittings the CP-8 has capacities to 1250 ft., the CP-15 to 2250 ft. For more complete information, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

new!



ATLAS *Shotmaster* BLASTING MACHINE

The first condenser discharge type blasting machine utilizing a high voltage DC generator directly connected to charge the condensers.

Dependable blasting starts with a dependable blasting machine. And this new Atlas blasting machine is designed to give you every advantage in dependability and safety.

Hand actuated generator operation does away with battery replacements and gives consistent voltage in both hot and cold weather.

Built-in Volt Meter shows actual voltage while the condensers are being charged.

Adequate voltage assured. The condensers cannot discharge into the firing circuit below a predetermined voltage.

No danger of a residual charge in the condensers. With the condensers connected directly to the generator, any residual charge is dissipated quickly.

Simplified operation. The generator is hand operated. The firing trigger may be closed or open during the voltage build-up. Only when the voltmeter needle indicates optimum power can the firing circuit be activated.

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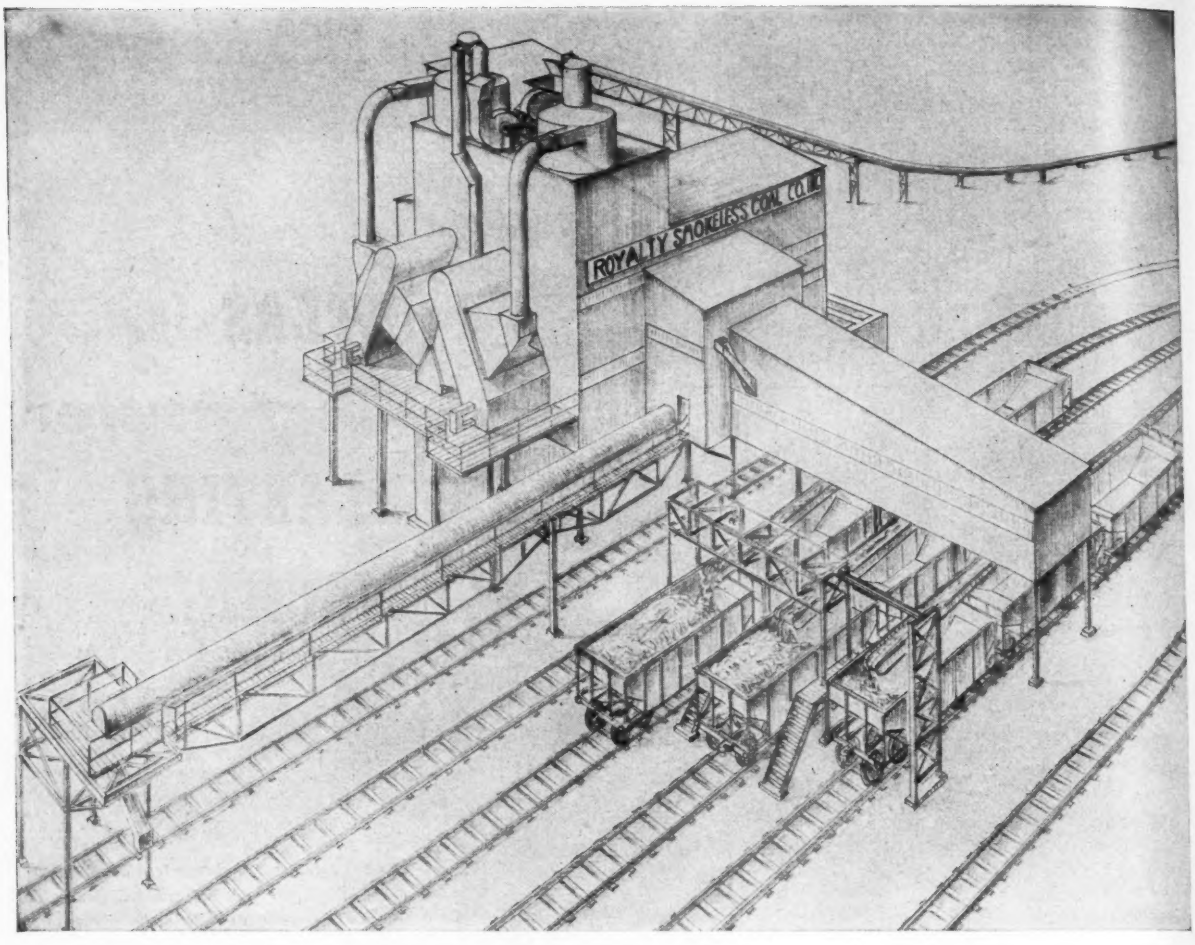
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Mining Congress Journal

Published for the Entire Mining Industry
by the AMERICAN MINING CONGRESS
JOHN C. FOX, Editor

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What of the Future?

THIS issue of MINING CONGRESS JOURNAL contains the report of the thirty-first Annual Coal Convention of the American Mining Congress. Keynote of the convention was optimism for the future. This feeling pervaded every session as well as the conversations before and after the meeting, that are so important and valuable a part of every convention.

It is true that certain segments of the mining industry, including coal, are in a depressed state at this time, with no way of predicting just how soon an upswing may be expected. From a broad standpoint, however, the demands of our growing economy and rising population will inevitably be reflected in our basic raw materials industry. Reliable estimates place our population by 1960 at 180,000,000 persons—20,000,000 more than when the last census was taken. Such an increase in population means at least a proportionate increase in consumption of all the materials, energy sources and finished goods that make our standard of living the envy of the civilized world.

At the convention, authoritative predictions were made pointing to a requirement for coal by the electric utility industry alone of 250,000,000 to 300,000,000 tons by 1965—more than double the present consumption for this purpose. These mounting demands coupled with those of the steel industry which will be processing iron ore from our own country and from outside the United States, plus increasing use of coal as a chemical raw material and a source of liquid fuel all add up to the forecast of a billion tons of coal per year by 1975.

Of more immediate moment are the discussions between coal industry representatives and Government officials regarding steps which our Government can take to alleviate the present depressed state of the industry. Coal industry leaders—following this meeting—met in Chicago to draft a program for presentation to the proper authorities. True to coal mining's tradition, the program they will propose will not call for any outlay of Federal funds.

Governors of 16 coal producing states have also gone on record as advocating early action to control excessive imports of foreign fuels which are damaging coal mining in the United States.

With such backing and unified effort by the industry, coal's pressing problems can and must be solved and the industry can begin planning for a brighter future. The general atmosphere at the 1954 AMC Coal Convention was one of optimism, and as we look farther ahead we agree with those who translate the words "Past Is Prologue" as "You ain't seen nothing yet."

The Next Generation

IN high schools all over the country June is the month of graduation exercises. Over a million young people will be graduated this month and the majority will be seeking jobs of one kind or another. From their ranks will come the engineers and managers of the future. How can they be attracted to the mineral industries?

A full discussion of this topic by mining executives and leading educators was carried in the April JOURNAL. Among the plans on which there was general agreement was the offering of scholarships by mining companies to qualified students.

Such scholarships are helpful but they frequently are limited to the costs of tuition plus a small additional amount for books and supplies. In some cases, also, the student is given a definite offer of part-time or summer employment. This accomplishes two results—it gives the prospective engineer practical experience and puts cash in his pocket to cover other costs of his education—cash he has earned himself.

Aside from the immediate financial aid to the embryo engineer, summer work programs reduce the chances of a "misfit" when it comes time for permanent employment. The student can decide for himself whether he wants to make mining his career and the company can decide which of the summer employes are wanted on its engineering staff. Such a mutual "sizing up" period can result in substantial savings to the companies and avoid the heartbreak and confusion suffered by those who may discover too late they are not happy in the field they have chosen.

The mining industry has perhaps lagged behind other progressive industries in its efforts to arouse interest among young students. However, a growing number of metal and coal mining companies have adopted policies of offering scholarships and summer work to students who feel they would like mining. One Colorado concern (see p. 103) has added the unique qualification that the prospective engineer shall *not* previously have considered the mineral industry as his field. This experiment will be watched with great interest.

The problem of the shortage of young engineers is so acute that every possible means should be employed to attract promising youngsters and to make it worthwhile for them to continue their careers in the mineral industry.



Coal has been ever ready to join with industry to make more efficient and effective use of solid fuels

Atomic Energy and Its Industrial Applications

Coal Will Continue to Supply Major Portion of Thermally Produced Energy. Electric Utilities Will Probably Need 253 Million Tons Annually By 1965

By WALKER L. CISLER
President
The Detroit Edison Company

ABOUT a year ago I was intrigued to observe Consolidated Edison Co. of New York, Inc., using the expression "Energy Is Our Business" very effectively in its public relations activities. I was struck by the simplicity and appropriateness of those four words in expressing a fundamental responsibility of the electric power industry.

As I thought about what I should fittingly say here today, those four words, "Energy Is Our Business," again came to mind because surely our interests—the coal mining industry and the electric power industry—are in many respects concerned with energy. You in the mining industry are engaged in developing coal, probably one of our greatest natural energy resources, and making it available for whatever practical and economical uses to which it may be put. We in the electric power industry are engaged in upgrading energy from its most primary forms; fossil fuels and falling water, into a higher form: electric power; and in the distribution and sale of electrical energy for all kinds of purposes.

Our two industries are in fact inseparably related. The coal industry today has as its largest customer the electric power industry. In turn, the electric power industry could not have reached its present level of development and could not continue to meet its present commitments without an adequate supply of coal. This has been and is a most constructive relationship and one which, as I hope to show quite clearly, will continue for many years ahead.

Walker L. Cisler's address, at the American Mining Congress Coal Convention in Cincinnati, holds so much of interest to all mining men that we are reproducing it here in its entirety.

The thought of mutual interests is particularly appropriate during this Diamond Jubilee Year of the Electric Light and Power Industry in the United States. These 75 years have brought tremendous advancements to the world, probably far greater than in any other similar period of time. And electricity has been one of the key factors which has made those advancements possible.

There has been tremendous progress too, as we all know, in the electric power industry itself, brought about in large measure by the coordinated efforts of the coal and power industries. Coal has consistently been used as the source of energy for the major part of the electricity generated in this country, and continues to be increasingly important in this respect. The coal industry has been ever ready to join with the power industry in the endeavor to make more efficient and effective use of solid fuels.

Both the coal and electric power industries justifiably may take great pride in their accomplishments. In 1882 the world's first central station, Pearl Street in New York City, required 138,000 btu or approximately 10 lb of coal per kwh generated. Astoria, the newest generating plant serving New York City, which was brought into operation only last year, requires less than ¾ lb. of coal per kilowatt hour, a ratio of about 13 to 1.

Atomic Energy—Another Natural Resource

Today we have atomic energy with us, a vast new source of energy, which, in the years ahead, most certainly will have many industrial applications and a marked influence on industry throughout the world. Because these potentialities are so broad, my remarks will be limited to the use of atomic fuels for the generation of electric power, and the probable effects upon fuel requirements for power generation.

The development of atomic energy is a fact which we must accept. As "Boss" Kettering recently said of atomic energy development — "Don't fight the future." The unlocking of the power in the atom has been brought about by scientific discoveries which have been in the making for hundreds of years. Man's efforts to learn more about nature have again been successful. Regardless of the awful military aspects of atomic energy, we cannot legislate against or postpone further development. It is destined to go on.

We must develop peacetime uses for this new source of energy and integrate them into our industrial and economic systems. It is my thought that if this is done rationally, with full consideration to all economic factors, no one will be hurt. Rather, we will experience a sustaining advance in our economy and our standard of living.

Developing this thought further, I wish to point out that since the beginning of the human race, the world has undergone continual changes, developments and advances. These we expect and look forward to. We are all familiar with these developments as related to energy. Prehistoric men first learned the use and control of fire. Over the years men have learned to use energy for many and diverse purposes. In this respect, wood, coal, petroleum and natural gas have all had important parts and we look forward as a matter of course to further advancements in the use of the more abundant of those.

There is a rising awareness of this concept throughout the less developed areas of the world. Atomic energy has brought a great hope to the underprivileged masses in those areas that their lot might be improved. President Eisenhower, in his speech before the United Nations General Assembly on December 8, 1953, heightened those hopes. Thus we are in a position in which the entire world eagerly awaits the early realization of atomic power. These hopes may not be entirely justified, but certainly industry cannot avoid making a most exhaustive effort to take full advantage of the potentialities.

I believe we all understand that the atomic processes with which we are concerned make available to us for the first time a source of energy not dependent upon heat radiated to the earth from the sun. Rather, the energy involved is produced by the conversion of mass into energy, by reactions similar to those which produce the virtually unlimited heat energy of the sun.

Professor Albert Einstein in 1905 postulated his theory of relativity and gave the world his famous equation stating that there is a definite relation between mass and energy

$$E=MC^2$$

where

E=Energy
M=Mass
C=A constant equal to the speed of light—187,000 mi. per sec.

If we apply the proper values in this equation, we come up with the startling result that if one pound of mass — say, uranium — is completely converted, the energy produced would be something like eleven billion kwh of electricity. This is because the speed of light, 187,000 mi. per sec., when converted to feet per second and squared is a very large number indeed (32.5×10^{18}). Eleven billion kwh is approximately the total production of Detroit Edison's generating system for the year 1953.

Actually only a small fraction of the uranium fissioned in a reactor is fission products. Physicists tell us that one pound of uranium, when converted to energy; the remainder is fissioned in a reactor, will produce the heat equivalent of 1400 tons of coal.

Some of our scientists have the opinion that this same conversion of mass to energy undoubtedly takes place during the ordinary combustion of coal. The amount converted, however, is extremely small, perhaps of the order of one pound out of a billion, and therefore cannot be measured by any available physical test.

Atomic Energy for Power

There is great activity in the United States and other parts of the world in the endeavor to develop practical and economical means of releasing atomic energy for peacetime purposes and particularly for the generation of electric power. This vigorous activity is understandable.

The problems are great indeed. Nuclear fission and chain reactions will occur only under very exacting conditions. And because of the scientific principles involved, the heat must be released in and removed from a comparatively small space. Materials in and adjacent to the space where the nuclear fission occurs may be damaged or destroyed, and wherever nuclear fission does occur, the most difficult matter of controlling extremely dangerous radiation must be faced.

The Dow Chemical-Detroit Edison and Associates Atomic Power Development Project has as its objective the development of a breeder reactor which will produce electric power on a commercially competitive basis. A program of research and development for 1954, calling for the expenditure of $2,600,000, is well in hand.

This associated group at present comprises 18 electric power systems in the eastern part of the country, one chemical company, four manufacturing companies and three engineering firms.

A fast breeder reactor was selected because of our belief that this type has the greatest promise of being commercially successful. With this type of reactor, more fissionable material is produced by the transmutation of fertile material than is burned in producing the heat. This is not a perpetual

Table 1—World Reserves of Fossil Fuel and Nuclear Energy

Fuel	World Reserves	Total Energy Btu
Coal	3482 Billion Tons	72.2×10^{18}
Oil	1241 Billion Barrels	7.6×10^{18}
Gas	560 Trillion Cubic Feet	0.6×10^{18}
Total Conventional		80.0×10^{18}
Uranium	25 Million Tons	1700×10^{18}
Thorium	1 Million Tons	71×10^{18}
Total New Fuel		1800×10^{18}

In the effort to evaluate the importance of atomic energy as a natural resource, the Atomic Energy Commission has prepared estimates of the world's recoverable resources of uranium and thorium, the two natural elements which can either be fissioned or transmitted into fissionable material. These total some 26 millions of tons (see Table 1) and the potential energy available is estimated as 23 times as great as that of all the world's conventional fuels. This accounts for our statement that atomic energy as a resource is vast in extent.

A power breeder reactor, after its initial fuel charge, would operate on natural or depleted uranium. It could thus be independent of present governmental production plant activities and would utilize a large percentage of motion scheme since material is only converted from one form into another more useful form.

the total uranium rather than just a small fraction of it.

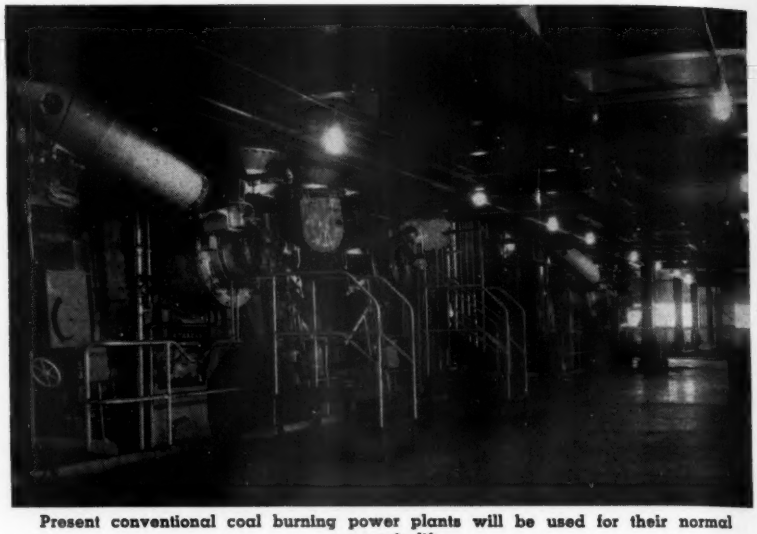
A small sized breeder reactor has been operating at the National Reactor Testing Station in Arco, Idaho, for more than two years and the principle of breeding has been demonstrated.

To Build Power Reactor

Progress is being made toward the solution of many of the scientific and engineering problems involved in reactor design. This has been quite recently demonstrated by the agreement between the Atomic Energy Commission, Duquesne Light Co. and Westinghouse Electric Corp. to build a large size power reactor near Shippingport, Pa., about 25 mi. from Pittsburgh. This is a pressurized water type of reactor, known as PWR.

A program for other types of power reactors, generally of smaller size, to be completed within five years has been approved.

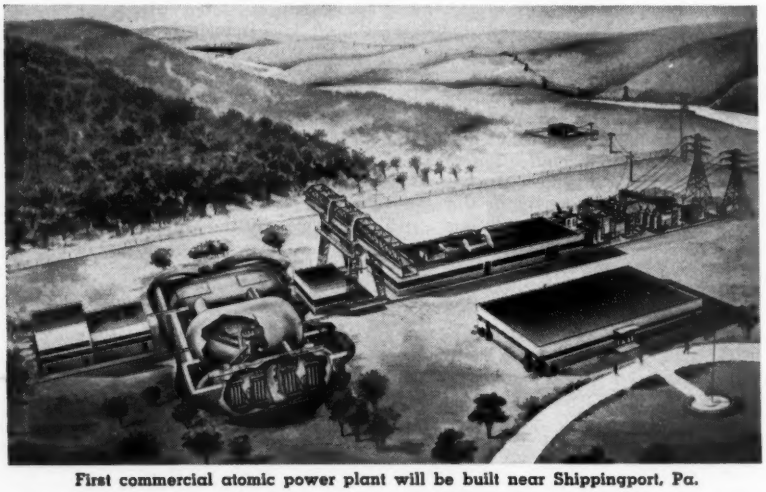
The statement which has been made by AEC and others that the atomic plant to be built at Shippingport probably will not be economically competitive with conventional methods of producing power is of particular significance. The use of atomic fuels for the generation of electric power on a commercial basis can be justified only when power can be produced at a cost no greater than the cost with present-day conventional fuel sources.



Present conventional coal burning power plants will be used for their normal economic life

Several years will be required to demonstrate whether they are suitable and sufficiently reliable for power system service. Following this, other reactors must be designed, built and tested before their extensive use for power generation can be generally accepted.

Thus, because of the scientific and engineering problems involved, and without regard to the economic factors, atomic power probably cannot become substantially important in the matter of total power supply within the next ten to 20 years. This does not indicate a feeling of discouragement. We will be making progress much more rapidly than expected a year ago if we do achieve this time schedule.



First commercial atomic power plant will be built near Shippingport, Pa.

Some of the types of atomic reactors being studied hold considerable promise of commercial success but extensive development work remains to be done. We can be certain, however, that several large size test installations will be built within the next five or ten years, either by the government, or preferably by competitive industry. These will be in the nature of test installations and will have only relatively small generating capacity when compared with the interconnected power systems of our country.

Economic Factors

The economic aspects of the situation require continued thoughtful consideration. The source of energy used for power generation today is determined largely by competitive costs. Many of our thermal power plants use either coal, gas, or oil dependent upon price and availability. Others use coal from two or more mining areas. Thus in 1953 the electric power industry consumed 115.9 million tons of coal, 1,032.0 billion cu ft. of gas, and 82.3 million barrels of oil—the equivalent of 178.7 million tons of solid fuel.

In the long run, the use of atomic fuels for power generation must be on a similar competitive basis. We do not know that the power reactors now being considered can meet this test.

Up to the present time, the capital cost of building reactors seems to be higher than can be justified for competitive power: In addition, there is little definite knowledge concerning the real cost of the atomic fuels which will be used. Finally, there is the possibility that reactor products may have substantial commercial value. All these things enter into the economic evaluation and must be given proper consideration. Further, because the cost of conventional fuels vary widely in different parts of our country, a reactor which might be competitive in a relatively high fuel cost area, such as the New England States, might not be justified economically in a coal mining area or close to such an area.

Power systems throughout the country are becoming increasingly aware of the technical, economic, and legal problems related to atomic power and I am sure will make appropriate decisions.

Effect on Fuel Requirements

If we proceed along the rational lines indicated, the influence of atomic energy on the fuel needs of the power industry will be small in the next decade and probably not great for the next 20 years. We must keep in mind the continuing increase in the consumption of the fossil fuels.

Looking Ahead

At the end of 1953 we had approximately 69.4 million kw of thermal electric generating capacity serving the interconnected electric power systems of this country. An additional 28.1 million kw of thermal capacity was on order and scheduled for service prior to the end of 1956. We can definitely see nearly 100 million kw of thermal generation plus approximately 25 million kw of hydro capacity for the power systems of the United States before the end of 1956.

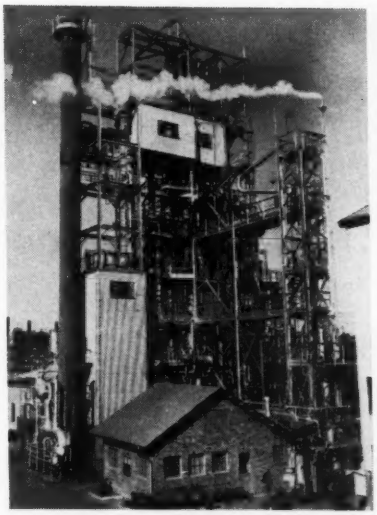
If we maintain the present ratios of fuel consumption, the coal requirement for 1956 will increase to about 165 million tons. It is possible that the proportion of coal utilized may increase.

Looking farther ahead, we believe that the power requirements of the country will continue to increase and that new generating capacity must be installed to meet the increased demand. The present practice of building conventional fuel-burning plants will continue and quite probably at an expanded rate. If we assume that the annual electric power load growth averages six or seven percent per year, which is much less than has been experienced during the last ten years, we will need to construct perhaps seven or eight million kw of thermal generating capacity each year just to meet increases in the use of electricity. This could bring us up to 150-175 million kw of thermal capacity by 1965 and this would require the use of approximately 250 million tons of coal annually.

The expansion of our present conventional fuel burning facilities is sufficiently developed to assure a definite place in the power industry. This, as pointed out earlier, is likely to be ten to 20 years in the future. Even then, atomic plants would meet only a part of the added requirements.

We also should remember that the conventional fuel burning power plants which are now in existence, and which will be built in the years ahead, will be used for their normal economic life. Our studies go to show that the economic advantage of atomic fueled plants probably will not increase rapidly enough to replace existing conventional fuel-burning installations. We cannot afford to discard or abandon investments in plants which are in good, serviceable condition.

Though we have no knowledge concerning the competitive position of fuels in the future, it is realized that our resources of oil and gas are being gradually depleted. It appears, too, that the requirements of these fuels for so-called "higher uses" is increasing rapidly. We can expect, therefore, that coal must supply an increasing



Ultimately we will have to supplement our natural petroleum supplies with synthetic oil and manufactured gas

portion of the energy required for power generation.

Thus, from the standpoint of electric power, the possible adverse effects of atomic fuels on the coal industry seem to be quite far in the future. And in that period there will undoubtedly be important changes in the energy situation which may more than offset the adverse effects.

Synthetic Fuels

Our uses of petroleum and natural gas for purposes other than power generation will continue to increase. While we have maintained adequate reserves through new discoveries and improved production tenchniques, the time ultimately will come when it will be necessary to supplement our natural supplies with synthetic oil and manufactured gas. Technical processes for the former have been developed but at present are not economically justified. You are familiar with this situation. A comparatively small change in costs could alter the situation materially. We might say that coal occupies approximately the same position with respect to our petroleum and gas supplies as atomic energy does to coal for electric power generation.

Energy Is Our Business

We who are concerned with the supply of energy have always faced a future subject to continuing change. We have accepted that situation as a part of our responsibility. One of our most important mutual considerations has been the availability of coal at economic price. It is a problem which will be with us for a long time ahead.

Atomic energy is of vast proportions and has tremendous potentialities. Its use will be limited at first by the need to surmount scientific and engineering barriers. So far as we can see, it will never be a thing that is easy to handle and use. These are limiting factors. Therefore it can never supplant many of our present fuel requirements.

It is my thought that the need for coal for power generation will continue at well above its present level for many years. Energy will continue to be our business. And coal will remain an important factor in it.

I believe there is room for both.



Need for coal in power generation will continue at well above its present level for many years to come



A smooth running mine starts at the oil well *(Photo courtesy Cities Service Co.)*

Lubrication of Metal Mining Machinery

Industry Operates on Thin Film of Oil

By A. F. BREWER, M.E.
The Texas Company

METALS mining has been an industry since prehistoric times. It was several thousand years ago that some observant prehistoric man discovered pellets of pure iron or copper in the ashes of a fire he had built by chance on the outcrop of an ore vein. That was the beginning of the association of fire with the conversion of metallic ores to more or less pure metal.

There was no need for lubrication in those early days. That came later, when the machine age had developed suitable machinery and when mass production in manufacturing made necessary the large scale output of metals and minerals.

Here the lubricating engineer came into the picture. As the emissary of the Petroleum Industry he fits tailor-made lubricants to tailor-made machinery. The ability of mining people to meet present-day requirements for the metals, so vital in war or peace, testifies to the high degree of cooperation which prevails.

Mining Procedure

Mining operations can be divided roughly into two types, i.e., open pit or surface mining, and underground or shaft mining. The choice depends on the structure, location and richness of the ore.

Modern mining has become highly mechanized, with air power and electric power predominating below ground.

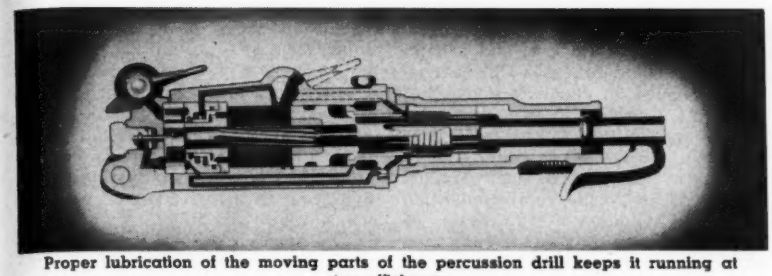
Drilling the First Operation

Mining starts with breaking the ore material in the vein from the surrounding rock. This requires drilling and blasting. The conventional air-powered rock drill is mainly used for this purpose. As the preliminary and one of the principal operating mechanisms, its lubrication plays an important part in keeping the ore flowing.

Drill operation must be understood in selecting a suitable lubricant. The modern rock drill does its work by percussion or rapid hammering, or, in some cases by a combination of pressure and rotation. Where percussion is employed, air pressure acts on the tool mechanism much as steam acts on the pistons of a steam engine. This requires a cylinder with suitable piston and valve arrangement for the admission of air at the proper time, according to the number of strokes per minute. Two sets of valves are normally involved, i.e., the throttle valve which enables the operator to control the amount of air admitted; and the working valve which, through suitable timing, controls the frequency with which the air pressure is allowed to react on the piston.

Effective use of air has a direct relation to the power bill and wear of equipment. Selection of suitable lubricants for drills which may be exposed to low temperatures is especially important, for low temperature increases the resistance to flow, thereby rendering petroleum lubricants more sluggish and less likely to reach all the mechanisms in certain types of tools. Hence the importance of low pour test and relative viscosity in predicting to what extent dependable lubrication will be maintained.

Lubrication Procedure—While the type and extent of refinement of the lubricants employed have much to do



Proper lubrication of the moving parts of the percussion drill keeps it running at top efficiency

with efficient operation of any rock drill or pneumatic tool, the means whereby the oil is admitted or distributed have a marked effect upon ability to function effectively. Even the best rock drill oils may fail to do their work if they cannot reach all the wearing elements of the tools. Many authorities feel that more failures or complaints arise from ineffectual lubrication through misuse of oils, or lack of knowledge as to the requirements for good rock drill lubrication, than from any average operating condition. In most cases, this is due to lack of appreciation of the lubrication requirements of the equipment.

Rock drill lubricants are refined to function with a minimum of fluid friction, and a maximum of sealing power in the prevention of air blowby past the pistons. Needless to say they must have excellent lubricating ability, and a pour test commensurate with the operating requirements. Naturally the operator must use these products intelligently, in accordance with the recommendations of the builders of his tools, and the oil company from whom he purchases lubricants. Makeshift ideas cannot be tolerated. Today, continued and efficient operation demands that the most modern means of lubrication be used.

Air Line Oilers—Air line oilers are generally intended for the handling of fluid oils. They work on the principle of suction, atomization or pulsation. For best operating performance an air line oiler should be located six to eight ft ahead of the drill. In the suction type, as the air passes through the working mechanisms it draws the requisite amount of oil from the reservoir by suction. Where atomization is involved, there is a needle or pin valve through which a certain amount of air passes to carry the required lubricant forward into the tool. In either case, air as it passes through the lubricator becomes charged with oil in finely atomized condition. This insures complete distribution of oil to all parts of the tool.

The pulsation type lubricator operates through the action of the reciprocating piston. This keeps a regulated flow of oil going to the air and tool mechanisms. Such a lubricator is frequently built with an oil capacity sufficient to last a working shift to reduce the possibility of lack of lubrication. Control of the oil flow is helpful not only to reduce consumption but also to reduce the possibility of dieseling or fog.

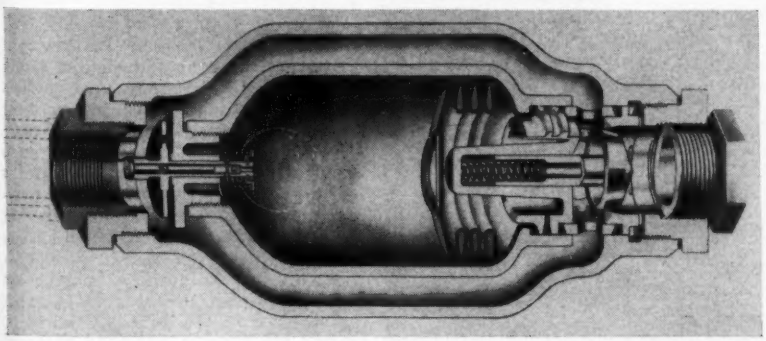
Lubricant Characteristics—Rock drill lubricants are specialty products, prepared to meet certain specific conditions of operation and means of application in drills, stopers and drifters. When valves, pistons and other rotating and reciprocating elements are to be oil lubricated and dry air is used, a straight mineral, low pour point oil is often satisfactory. The viscosity normally should be from around 500 to 750 seconds Saybolt Universal at 100°F. and the oil should be selected to develop the least amount of hard carbon.

In service where wet air is used it will be necessary to compound the base oil with a certain amount of fixed or fatty oil to offset the washing effect of water.

In turn where the service is unduly severe an oil prepared with an E.P. additive may be required. Extreme pressure properties are advantageous in rock drill oils where rifle bars, nuts and other moving parts must be protected against wear in severe service, for example, where deep holes are to be drilled or very hard ores are involved. The addition of a rust inhibitor further improves the protective nature of such a lubricant.



The air line oiler is a vital part of drilling equipment



Ore Gathering

Ore is gathered according to the type of mining involved. In underground work the modern scraper-loader is widely used. The scraper-loader as specifically designed for underground mining is a gathering, conveying and materials handling machine. The gathering or scraping mechanism digs into the loosened ore and drags it onto the conveyor or chute which then unloads into the mine cars.

Lubrication of any ore handling machinery must be given careful consideration, because the machine parts may be continually in contact with abrasive materials. Gears, chains, wire rope and bearings are involved, according to the design of the machine. In addition, on certain loaders built for hydraulic operation, oil will be required in the hydraulic system. Such oil also may serve to lubricate the interior parts. Automatic lubrication has received careful study in appreciation of the productive importance of the loading machine.

Automatic lubrication may involve lubrication of gearing and gear shaft bearings by splash from the oil in a reservoir which is formed by the gear case, or the use of some form of

pressure lubrication, handling either grease or oil, according to requirements of the wearing elements and the manner of housing.

Automatic lubrication is advantageous in that it usually enables the lubricant to perform its intended function of reducing metallic friction and wear more effectively. Furthermore economy of lubricants results, for as a general rule, such lubricating systems are more nearly of oil-tight nature. This prevents entry of dirt or mine water, as well as leakage of lubricant.

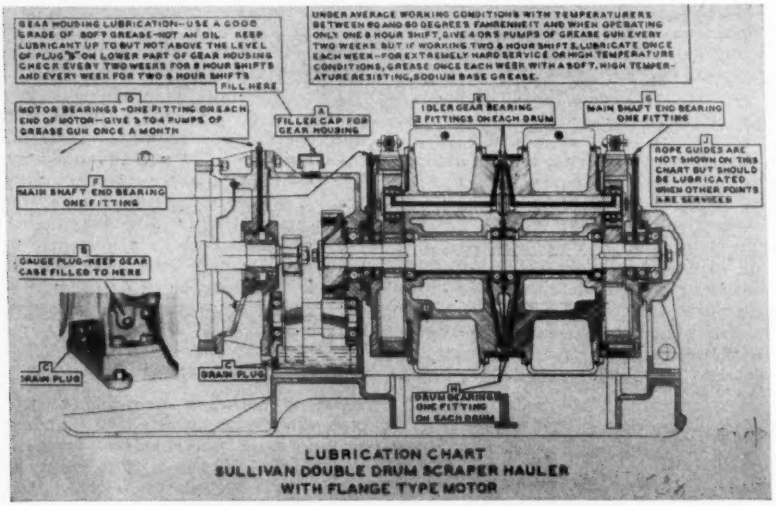
The design of the system dictates whether oil or grease should be used. Where the operating mechanism can be served from a central reservoir, it will usually be advisable to use a relatively heavy bodied, straight mineral oil or a mild E.P. gear oil. Such products will follow all gear and pinion teeth readily, will maintain a suitable film of lubricant in all normal bearing clearance spaces, and will insure that chain roller or link mechanisms receive an adequate amount of lubricant to protect interior parts.

It is practicable, for example, also to use a grease of fairly soft consistency in gear cases of tugger hoists. In fact, this is the recommendation of some builders. Care should be taken, however, that any grease used is compounded with a high grade of low pour test mineral oil; otherwise, should low temperature conditions prevail there may be congealment and lack of sufficient lubrication, especially in low bearing clearances.

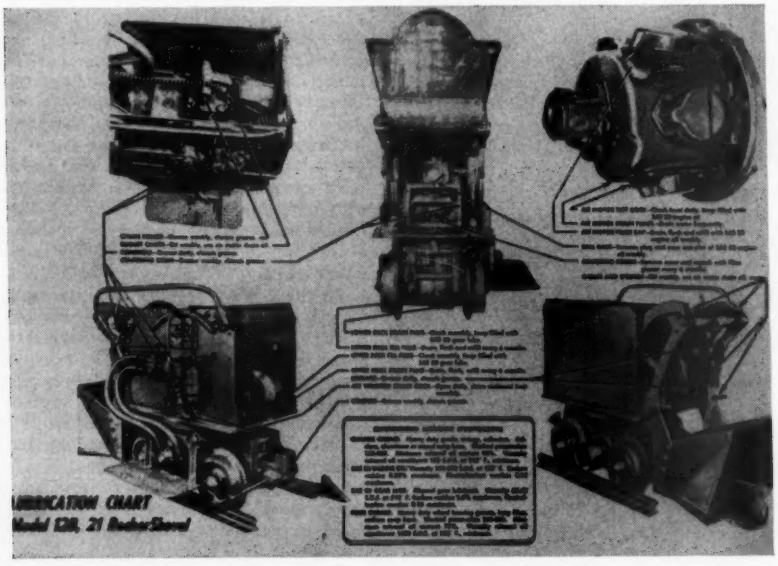
When the machine is built for hydraulic operation of the gathering, shoveling or conveying elements, a high grade machine or engine oil of around 200 to 300 seconds Saybolt Universal viscosity at 100°F. may be used. Here again good fluidity is a factor in order to assure adequate lubrication of plunger rods, etc., without excessive power consumption at low temperatures. Resistance to rust and oxidation imparted to the oil by suitable additives, increases the durability of the oil and protects the machine parts against rusting when operating in the presence of water or moist air.

The exposed parts of any machine used for ore loading, such as the chains, tractive elements, bearings, etc., which may require periodic hand lubrication can be served by machine oil of about 200 seconds Saybolt Universal viscosity, or a medium consistency grease, according to the means provided for application.

Exposed gears, in turn, require a straight mineral, semi-fluid lubricant. Such a product will insure adequate protection of gear teeth, with minimum loss through dripping or throw-off by centrifugal force during operation.



The lubricant chart is an important document



Mine Cars

Mine car wheel bearings are probably the largest consumers of lubricants, particularly in underground mining. As these bearings carry considerable loads they must be protected against failure. Effective lubrication is a most important factor in keeping them in service.

The type of bearing naturally dictates the type of lubrication. Such bearings may be grouped in four basic classifications, according to whether they involve: sleeve construction; hollow axles; self-oiling or cavity wheels, or ball or roller bearings.

The Sleeve Type—Sleeve type bearings employed in journal boxes often are so constructed as to enable the use of oil-saturated wool yarn or waste packing. Their lubrication is assured by regular attention to loosening of the waster, or oil-carrying material and resaturating with a suitable grade of straight mineral bearing oil or a light grade of liquid grease. Matting or glazing of the oil-carrying materials is detrimental. It reduces the capillarity of the packing, and prevents circulation of the lubricant. Stirring or loosening of the packing periodically will help to retard glazing of the surface in contact with the journal.

Hollow Axle Design—In this type mine-car wheel the axles are of tubular steel. Since they are hollow throughout their entire length they serve as reservoirs for the lubricant. At the outer end of the axle, near each extremity is a flat valve seat and a spring loaded valve similar to an ordinary check valve except that the guide is several inches long. A spiral spring encircles the valve stem and compels the valve to maintain a bearing on the seat which prevents leakage of lubricant from the axle. At the point on the axle corresponding to the bear-

ing surface of the wheels, the axle tube is perforated sufficiently to permit passage of the lubricant from within the axle outward to the contact surface of the axle with the bushing of the wheel hub. As a result lubricant is constantly working its way outward to maintain a protective film between the wearing parts, and when the proper type of grease is used, the cost of maintenance and parts renewal should be very low.

An N.L.G.I. No. 0 grease or a medium-bodied oil can be used according to the design of the bearing. Normally where axle sealing valves function effectively, a charge of lubricant within the axle may suffice for several weeks.

Self-Oiling or Cavity Wheels—Mine car wheels of this type are lubricated from an oil or grease reservoir around the hub. During rotation, the lubricant is fed to the axle or journal through port holes staggered in the hub. This goes on whether the car is idle or running slowly. At higher speeds centrifugal force tends to carry the lubricant to the outer surface of the reservoir. For this reason, due to possibility of leakage, the amount of lubricant used should be carefully controlled. In general, the lubricant level should be kept on a line with the lower part of the axle, being checked when the car is standing still.

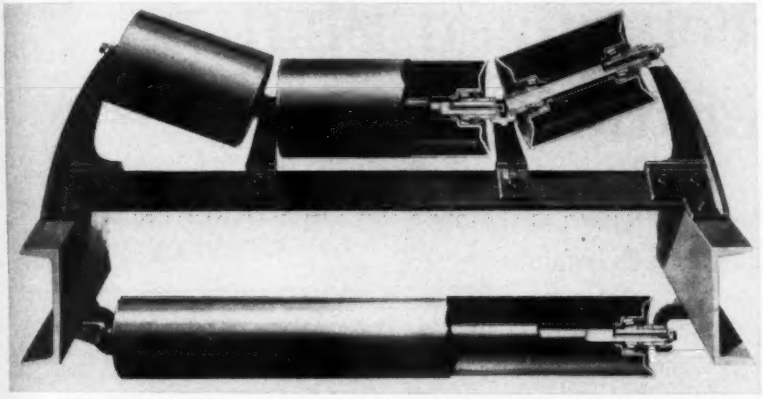
A highly refined straight mineral engine or car oil of from 300 to 750 seconds Saybolt Universal viscosity at 100°F. will in general be best suited to the operating conditions, and will insure most complete protection of the bearings. Where service in cold weather is essential, the oil, of course, should be able to flow through the distributing ports readily. It is also practicable to use a comparatively light grease of N.L.G.I. No. 0 grade where there is possibility of oil leakage.

Ball and Roller Bearings—Ball or roller bearings are widely used in modern mine car design; their use facilitates sealing against loss of lubricant or entry of contaminating foreign matter. Low maintenance costs and low consumption of lubricant also accrue.

Due to possibility of heavy loading, a grease for such bearings should be compounded with a fairly high viscosity straight mineral oil in order to obtain load carrying ability. The seals also make the use of high quality grease good insurance.

An N.L.G.I. No. 0 or No. 1 consistency grease is well suited for such bearings. Where the rollers are of solid, cylindrical or tapered construction, a somewhat more inert grease may be advisable than is used on hollow flexible bearings. Such a product will furnish a better cushion between the axle and rollers than a more liquid grease. Furthermore, it will also form a better seal against possible entry of dust, dirt or water, provided the bearing itself is equipped with a reasonably tight seal.

Lubrication of flexible roller bearings in turn can be done with a semi-fluid or so-called liquid grease. The usual construction of bearings of this type enables the hollow spaces within the rollers to serve as grease reservoirs. The lubricant therefore must be sufficiently fluid to pass through and penetrate to all the surfaces of contact. If it remains inert within the rollers, or tends to gum, starved lubrication of the bearing contact surfaces may result.



The proper lubricant at the right place keeps belt idlers rolling freely

Mine Locomotive Gears

Locomotive gearing and exposed chain drives should be lubricated with a straight mineral, residual lubricant of about 1000 seconds Saybolt Universal viscosity at 210°F. A product of this type will adhere tenaciously to the gear teeth and overcome vibration and wear. Where gears and chains are enclosed in oil-tight housings, however, a somewhat lighter lubricant can be used to advantage. Lower viscosity in normal operation will be conducive to reduction in drag and power consumption. The pour test of any such lubricant must be considered, for the probability of low temperature service above ground always will prevail. The degree to which satisfactory performance can be predicted is indicated by the pour test and relative change in viscosity with change in temperature. Obviously, a gear lubricant should be capable of following the gear teeth readily. If it balls up or drags at low temperatures considerable tooth wear may result.

Conclusion

Non-ferrous metals are of vital interest to the lubrication engineer. He is concerned with copper, tin, lead, zinc, antimony, nickel and cadmium as constituents of modern bearings; he is concerned with tungsten, titanium, molybdenum and vanadium as components used for alloying steels; and he is concerned with lead as a soap-base in the manufacture of extreme pressure greases, and aluminum as a soap base for certain other greases.

Conversely lubrication plays an important part in production of metals from mine to finished product. Modern mining machinery has been greatly improved as to speed and application of automatic lubrication systems. It is heavy-duty in nature, costly and so correlated that failure of any part may interfere seriously with the production schedule. It is the duty of the lubrication engineer to work with mine personnel to forestall such failures.

Uranium at Oka

ACCORDING to a recent news story, the atomic age has caught up with the little town of Oka, Quebec, home of the Trappist monks who make the world famed Oka cheese.

Only 35 miles from Montreal, news of uranium finds has suddenly transformed this little town into a buzzing focal point for more than 100 representatives of major Canadian and United States mining companies.

According to the representative of one company, every sample taken so far has contained uranium and finds have been highly encouraging. In addition to uranium other elements such as columbium, tantalum,, thorium and iron have been found in most of the samples taken.

Although the presence of minerals in commercial quantities was suspected as early as 1905 and some of the prospectors now on the scene began to work in the neighborhood about a year ago, it is still too soon to make any definite claims as to the size or extent of the mineral deposits.



Surface installations were carefully planned for maximum efficiency

A Highly Mechanized Shaft Sinking Operation

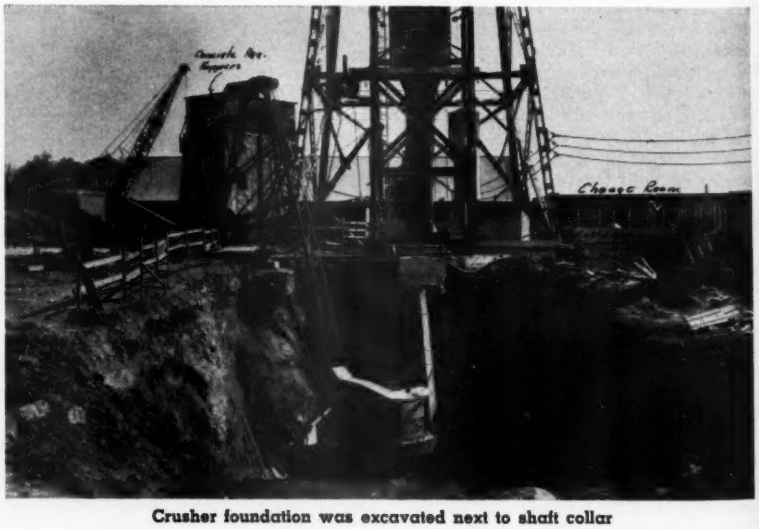
An Average Advance of 7 ft 4 in. With No Lost-Time Accidents Justifies Mechanizing Operations

By C. KREMER BAIN
Consulting Engineer
St. Joseph Lead Co.

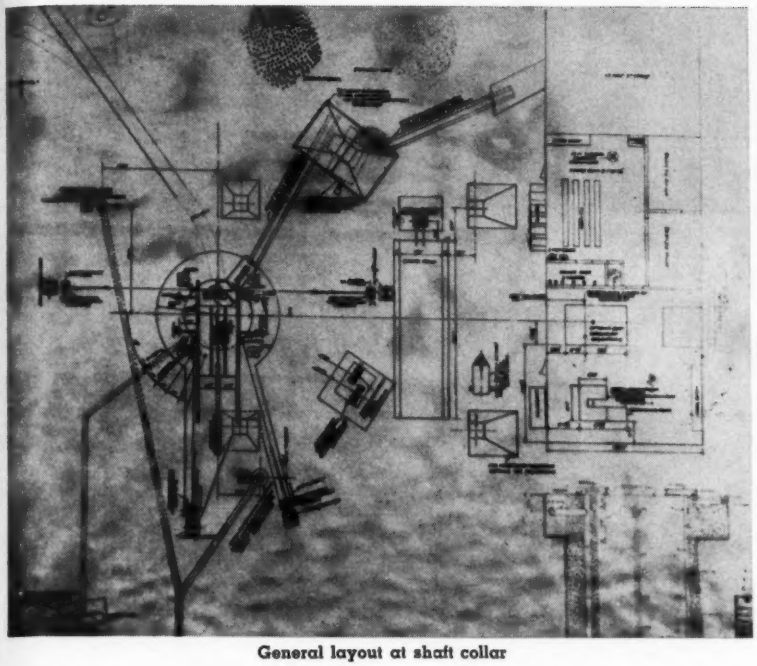
IN planning the Indian Creek Shaft for the St. Joseph Lead Co. to develop a new property in Washington County, Mo., the driving motive was to approach as nearly as possible 100 percent safety as well as mechanization in order to eliminate some of the hazards and the arduous work that usually accompany shaft sinking, and to build experience into the equipment to permit using unskilled labor.

The plan view of the shaft collar, hoist room, etc., shows the general arrangement of buildings and trackage to expedite changing the various types of equipment used in sinking the shaft. One side of the shaft collar was kept clear so that construction work on the crushing plant could be carried on at the same time as sinking operations.

Plans called for a concrete lined circular shaft 950 ft deep with an inside diameter of 12 ft 7 in. One 10-in. and four four-in. pipe lines that would later be used for air lines, electrical conduits, etc., were placed inside the concrete wall and carried down as the shaft progressed. Use of these permanent lines during sinking operations eliminated the need for temporary ventilation tubing and service lines for air, pump discharge. Four columns of H-beams were installed to function as part of the bracing for the steel concreting forms, and to serve as guides for hoisting and lowering the various pieces of equipment. These H-beams were prefabricated and drilled to a template so they could



Crusher foundation was excavated next to shaft collar



General layout at shaft collar

later be used as supports for the permanent guides. The permanent headframe was erected before the shaft collar was started, and every effort was made to eliminate temporary work which would later have to be replaced by permanent installations.

The equipment used in sinking operations consisted of the following:

(1) A 4-machine jumbo drill with each machine independent of the others. A fixed angle between the feed and the arms, in conjunction with an indexing device, provided a fast and accurate method for spotting the holes to the proper pitch and depth.

(2) A mucking machine consisting of two air motors with spring loaded brakes mounted on a foundation at the surface, and operated by remote control from the bottom of the shaft where the operator had complete control of the clamshell while in a position to observe its operation closely.

(3) A double deck steel work cage with guide shoes that engaged the four H-beams in the shaft. In addition to serving as a platform from which the men could work at any point in the shaft, it also provided facilities for lowering pipes, steelwork, equipment, etc., and served as internal bracing for the forms while concrete was being placed.

(4) A template, "wing forms," and "fan tail jacks" were used to locate the H-beam in proper position where they could be jacked solid after plumbing.

(5) Steel concreting forms, one for each quadrant, were so designed to be lowered inside the previously installed H-beams and wedged in place to make a solid circular form for the concrete. These forms were left in place until the next set of H-beams were installed, and then lowered to their new position.

(6) All electrical control wires were suspended from one steel cable and connected to a canopy. Lights and speaker for the communication system were installed in this canopy, as well as outlet plugs for the control wires for the mucker, electric hoists on work cage, signal system, and auxiliary lighting on work cage and jumbo drill.

Auxiliary equipment:

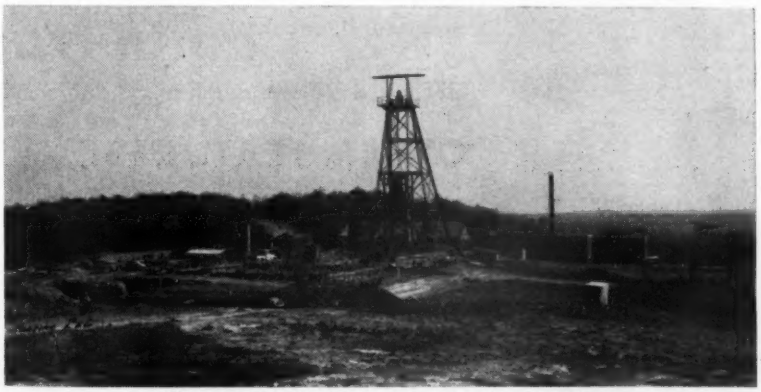
(a) A batch bin which accurately weighed sand, gravel and water which were fed into the bin by gravity from storage bins above.

(b) A 54-cu ft bucket, sliding shaft door, and hinged dumping door, which are practically duplicates of those used by Tennessee Copper Co. at Ducktown, Tenn.

(c) A positive displacement Roots-Connersville blower designed to handle 4000 cfm at 2½ psi.

(d) Blasting switch, grout pumps, sump pumps, compressors, drill presses, electric and acetylene welders, etc.

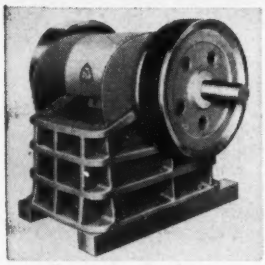
An average advance of 7 ft 4 in. per drill round without a single misbreak, provided fragmentation ideal for clamshell loading. This along with a record of no lost time accidents during the entire sinking operations justifies the statement that the equipment and methods came up to expectations.



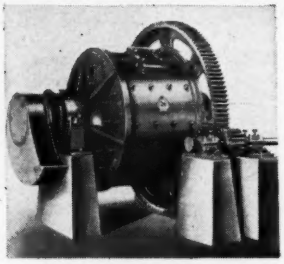
Shops and crusher house were built close to shaft



Shaft waste rock was disposed of close by



Denver Jaw Crusher



Denver Steel Head Ball Mill



Denver Standard Dryer



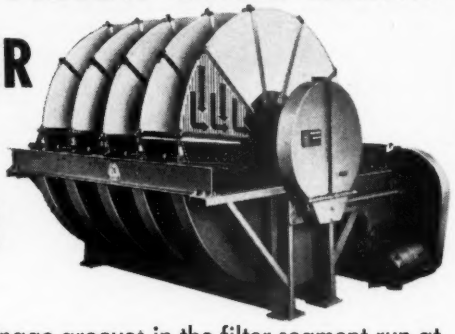
Denver Drum Filter



Denver Diaphragm Pump

DRIER FILTER CAKE WITH...

DENVER DISC FILTER



See how drainage grooves in the filter segment run at right angles to the suction edge of the filter segment?

This patented feature on DENVER DISC FILTERS mean positive drainage from each segment; no blow-back of filtrate into filter cake. RESULT: DENVER DISC FILTERS give drier filter cake.

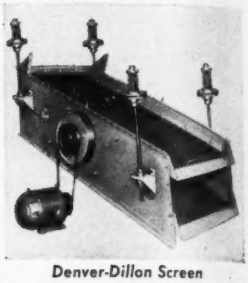
SIZES: 2′ x 1-disc through 6′ x 8-disc and larger.

OTHER FEATURES:

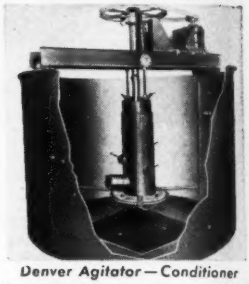
Divided tank permits filtering 2 products with same filter. Filter segment can be replaced while filter is in operation. Drive mechanism and valves are protected from dirt and slime. DENVER DISC FILTERS are simple in design; simple to operate and maintain.

FREE FILTER TESTS:

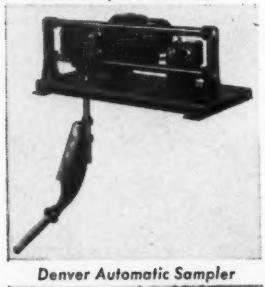
DENVER EQUIPMENT COMPANY will conduct filter tests free of charge to determine proper size and type filter for your requirements. Write today!



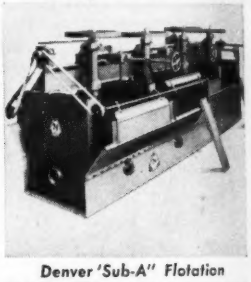
Denver-Dillon Screen



Denver Agitator—Conditioner



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R. E. Salvati introduced the distinguished guests at the Annual Banquet

1954 Coal Convention Exceeds Expectations

Industry Continues Drive for Higher Efficiency Through Modern Equipment—Program Outstanding



Edward G. Fox, president, Philadelphia & Reading Coal & Iron Co., served as Chairman of the Program Committee

CINCINNATI, Ohio, was the coal capitol of the United States, May 3 to 5, as some 1600 mining men from all parts of the nation gathered there for the 1954 Coal Convention of the American Mining Congress. Of the operating mining men present, 70 percent were presidents, top-management executives and engineers.

The program they heard contained, in addition to the ten regular sessions, two luncheon meetings at which prominent business men and government officials told the members of the coal mining industry what they foresaw in the near and far future.

At the opening session on Monday morning, Edward G. Fox, president of the Philadelphia & Reading Coal & Iron Co., and chairman of the Program Committee, presided.

Julian Conover, executive vice-president of the American Mining Congress, opened the meeting with a hearty welcome to the 31st Annual Coal Convention of the American Mining Congress and remarked that the meeting marked the 56th anniversary of the American Mining Congress.

He referred to some of the accomplishments of past years, but said the primary purpose of the meeting was to take stock of the present and to plan for the bigger and brighter future which lies ahead for the industry if all concerned will pull together to that end.

Conover emphasized that the coal industry is not made up of defeatists, but rather of men with plenty of "intestinal fortitude" who have overcome obstacles in the past—that being a major reason why coal mining has forged ahead, in bad times as well as good, to become one of the most modern industries of our country.

One field in particular which calls for concerted effort, he said, is that of national policies that affect coal mining, and in fact all branches of the mining industry. He emphasized the need for all those concerned with the industry's welfare to work with the American Mining Congress and other organizations, saying:

"We must intensify our efforts to see that the excessive imports of residual oil and other minerals, that are playing havoc with our mines, are held to a reasonable level.

"We must maintain adequate depletion allowances, and tax treatment



Julian Conover opened the first session

that will permit the developing of new mines and installing of modern equipment.

"We must insist that underground gas storage not be allowed to endanger existing mines or future reserves.

"Our labor laws must be fair to all parties—employers, employes and the public.

"Stream and air pollution legislation must be along practical lines, with rapid amortization available for the installation of treatment facilities.

"Defense planning must provide top priority for the mining and mining equipment industries.

"And, above all, our system of private enterprise and initiative must be upheld and strengthened."

Optimism the Keynote

Eugene Ayres, technical assistant to the vice-president, Gulf Research and Development Co., predicted a tremendous increase in the demand for coal, particularly as the prime source of electrical energy and synthetic liquid fuels. He told the convention that the consumption of electric power is rising more rapidly than the combined consumption of liquid and gaseous fuels. He also pointed out that domestic consumption of electricity is increasing more rapidly than industrial consumption and said that by 1965, when the demands for electric power are likely to be really heavy, we may have less petroleum than we need, even for liquid fuel applications. We cannot depend on foreign nations to fill the gap in our needs for fuel and energy, which leaves coal as the prime source of all power with the possible exception of small amounts derived from hydro-electric installations and nuclear power installations.

The electrical industries, he said, are pointing toward a goal of one trillion kwh by 1965. In order to produce this much energy, they will need 300,000,000 tons of coal in that year. That is more than 2½ times the amount of solid fuel consumed for electric power in 1953.

Ayres estimated that we can count on shale for about ⅓ of our so-called synthetic oil by 1965 and about ¼ by 1970, but said that while shale oil production increases, oil from coal will be produced more rapidly. "There can be no doubt," he said, "that our ultimate dependence for liquid and solid fuels must be on coal."

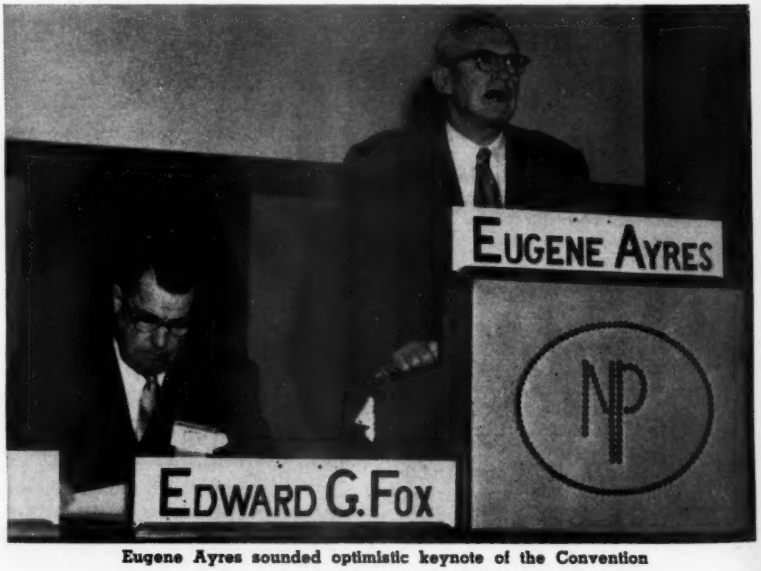
Safety Board Speaks

Another important feature of the opening session was the panel discussion among members of the Federal Coal Mine Safety Board of Review who explained their activities in carrying out the provisions of the Federal Coal Mine Safety Act.

Participating in this panel discussion were Edward Steidle, dean emeritus of Pennsylvania State University and chairman of the board; E. R. Price, retired manager of Inland Steel Co.'s coal properties; Charles R. Ferguson, director of the Safety Division of the United Mine Workers of America; Troy L. Back, executive secretary to the board, and John S. Forsythe, the board's general counsel.

Chairman Steidle explained that the principal purpose of the board is to safeguard against possible unreasonable or ill-founded interpretations and decisions by the personnel of the Bureau of Mines. That the board has thus far not handled many appeals demonstrates that the moral influence it has exerted to establish and maintain cooperation between the USBM and industry has resulted in greater coal mine safety.

E. R. Price, industry board member, termed the mine safety statute the first permanent venture of the Feder-



Eugene Ayres sounded optimistic keynote of the Convention



Federal Coal Mine Safety Board of Review explained their objectives and procedures

al Government into the field of compulsory Federal coal mine safety regulations. He expressed the belief that reduction of accidents can be made by close cooperation of management and labor together with the USBM and various state departments of mines. He commended especially the accident-prevention courses for mine workers and mine supervisors, which are conducted by the Bureau of Mines.

Representing the mine workers on the board, Charles R. Ferguson said he agreed that the board has acted both as a deterrent against arbitrary action by Federal Coal Mine Safety inspectors and as a deterrent to the appealing of cases which would not be legally sustainable.

Ferguson also pointed out that safety in coal mining will not be brought about by any one body, but through the cooperation of all the segments of the industry, such as the coal mine operators, Federal and State agencies, the United Mine Workers and others concerned.

Troy L. Back summarized the administrative functions of the board and explained how appeals are handled. He told the convention that the policy is to hear and determine each appeal in the shortest period consistent with minimum time requirements of the parties involved. He emphasized that no mandatory form for use by interested parties is necessary. There are several optional forms on which those making appeals can record their case.

John S. Forsythe, the board's general counsel, pointed out that appeals can be made only from orders issued by Federal mine inspectors and not on mere "findings" of violations. Forsythe also straightened out some of the confusion resulting from the feeling in some portions of the industry that appeals on violations of the Federal Coal Mine Safety Act and of the Federal Coal Mine Safety Code should be made to the board.

The board does have jurisdiction over appeals arising out of alleged violations of the Federal Coal Mine Safety Act. However, those who have been cited for violations of the Federal Coal Mine Safety Code and who are parties to the contract between the United Mine Workers of America and the operators, have a right to appeal to the Joint Industries Safety Committee in Washington. This committee, he said, was established under the coal wage contract for the purpose of hearing such appeals.

The Paradox of Coal

Immediately following the opening session, a luncheon was held in the Hall of Mirrors. L. C. Campbell, vice-president Eastern Gas & Fuel Associates, and chairman of the Coal Division of the American Mining Congress, presided. He called on the president of the American Mining Congress, Howard I. Young.

Mr. Young recalled American Mining Congress meetings of the past when the expositions of mining equipment were held in the Music Hall in Cincinnati. He commended the coal industry for the fine cooperation that it has always given in the work of the Mining Congress and said there never has been a time when closer cooperation among the extractive natural resources industries of this country with those who are working for their interests in matters of legislation and government policies was more important.

He spoke of the inroads made by excessive imports of competitive materials from foreign countries and the necessity of affording some measure of protection to all segments of American industry so that we can go forward and continue to build in the future as we have in the past.

Hon. Felix E. Wormser, assistant secretary for mineral resources of the Department of the Interior was the principal speaker at the luncheon. Wormser discussed some of the broad aspects of the coal producing industry with emphasis on possible ways to alleviate its present distressed condition.

"Today's situation," he said, "with respect to coal, is truly a paradox." Coal, the greatest known potential source of energy in this country, has been steadily losing its markets to other energy sources. Even without a complete inventory, we know the nation possesses almost inexhaustable quantities of this black magic substance. On the other hand, it is disturbing to witness declining demands for this plentiful fuel and the resulting depressed conditions within segments of the coal industry."

"There are two principal avenues of Government aid open," he said. "The Government can undertake to support prices or production or it can supply Government credit or subsidies in the form of direct payments or other benefits to producers. Government authority to condition the economic environment is something to be used with great restraint, especially for freedom-loving Americans. . . .

"Basically I am opposed to subsidies because of their drain on the public purse. They invite inefficiency, and lead to complete Government control. . . .

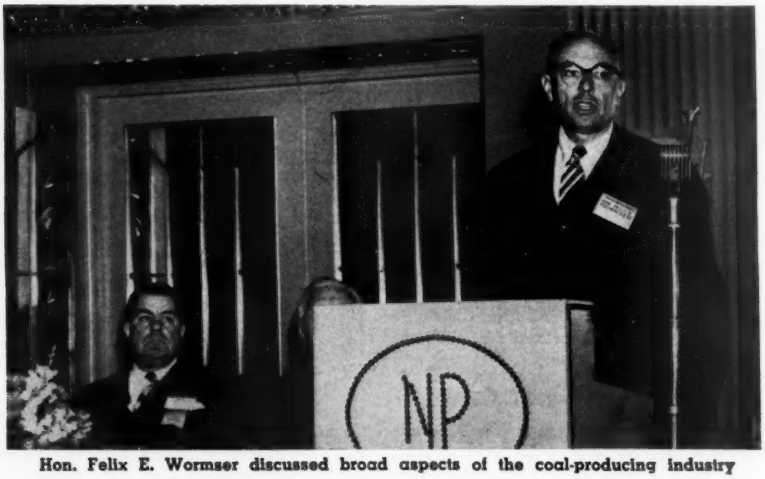
"I am increasingly aware of the interdependence of Government and Business, but at the same time I am more than ever impressed by the necessity of maintaining a sharp and in-



Howard I. Young spoke at the opening luncheon

violate line between the two. Too great dependency of industry upon Government is likely to lead to domination of industry by Government."

In regard to free trade and the import of residual fuel oils, Wormser pointed out that the Department of Interior is in an exceedingly difficult position in reporting on legislation to curb excessive imports. "It ill behooves us," he said, "to show partiality. On the other hand our intense desire that the natural resources of this country shall be fully developed to serve the interests of the American people, gives us great concern over the coal situation."



Hon. Felix E. Wormser discussed broad aspects of the coal-producing industry

He ended with an appeal for cooperation between Government and industry. "I hope we can work together," he said, "each respectful of the other—each aware of the separate areas in which we must function."

Roof Support Session

On Monday afternoon, J. W. Broadway, vice-president, Bell & Zoller Coal Co., presided at the session on roof support. First speaker of the afternoon was J. K. Berry, production engineer, Clinchfield Coal Corporation, Dante, Va. Berry's paper dealt with successful drilling of roof bolt holes in hard sandstone formation with tungsten carbide bits. He described drilling for placing 36-in. roof bolts in an area where the roof consisted of about two ft of fairly soft shale in the immediate roof, merging into a hard fine grained sandstone. It was desired to anchor the bolts in this sandstone bed, but the stratum had previously proved undrillable from a cost standpoint, using high speed, low pressure rotary drilling. Satisfactory results were obtained with a high torque drill by reducing rotation to about half speed for the last half of the hole and keeping the pressure at the maximum.

Giving the results of a group of time studies, Berry said that average drilling time was 68 seconds for a three-ft hole, with a total work time of 2½ min per complete bolt installation. The crew was able to set 100 to 135 bolts per shift. In drilling sandstone, bits had to be sharpened every 100 ft.

Martin Valeri, assistant to the general superintendent, and M. M. Fitzwater, mining engineer at the Buckeye Coal Co., described a central compressor station and the underground pipeline system for compressed air distribution to working faces. The full story was carried in the May issue of MINING CONGRESS JOURNAL.

C. S. Kuebler, assistant mining engineer, Lehigh Navigation Coal Co., prepared a report giving preliminary performance data on the use of yielding steel rings to support a squeezing tunnel in one of the Lehigh mines at Lansford, Pa.

David J. Crawford, Lehigh Navigation Coal Co., gave the paper in Kuebler's absence.

As described by Kuebler, the yielding steel ring support consists of four segments bolted together so that the joints can telescope under load. Thus, as the set takes weight, the size of the tunnel is diminished somewhat but the steel of the sets is not distorted. The yielding action is provided by a 16-in. overlap of the segments which become a friction joint when connected with two clamps and hook bolts. When these bolts are tightened with a force of 220 ft lb, the joints slide when a pressure of 25 to 30 tons is applied to the ring. The experimental rings have been in place for only a few months and performance trends are promising.

Recover Pillars

George L. Judy, vice-president, Consolidation Coal Co. (W. Va.), stressed the need to reduce coal losses and recounted various methods of recovering pillars, showing recovery procedure and roof control methods.

The fact that reserves of high grade metallurgical coal in this country have become quite limited makes it very important to get every bit of the coal out. The higher realization for this coal is another incentive for its removal. In these opinions he was seconded by J. A. Younkins, assistant general superintendent of the Coal Department, Duquesne Light Co. He added that the advent of continuous mining machines has reduced the number of active working places necessary for efficient operation. Thus it is possible to pay more attention to projections to insure maximum recovery from the mine.

Strip Mining Session

At the Strip Mining Session on Monday afternoon, H. C. Livingston, vice-president, Truax-Traer Coal Co., acted as chairman. "Truck Haulage Problems—Engines, Tires, Roads" was the title of a paper given by Andrew Hyslop, chief engineer, Hanna Coal Co. The paper was discussed by L. E. Briscoe, electrical engineer, Ayreshire Collieries Corp., and E. J. Dress, chief mining engineer, United Electric Coal Cos. Hyslop pointed out that it is not uncommon to find that coal transportation costs in strip mines may approach or even exceed the cost of overburden shovel operation and that strip mine trucking looms large as a fertile field for cost cutting. He went on to point out that a more accurate evaluation of a truck's capacity would be to use pounds payload per horsepower or pounds gross vehicle weight per horsepower as a yardstick.

With the large engines now available, it is difficult to find transmissions and axles which will take the high torque without excessive maintenance. This factor can be improved by increasing truck speed.

A breakdown of operating costs at Hanna Coal show that tire maintenance accounts for 21 percent of the total cost, other maintenance 28 percent, and drivers 23 percent. To keep tire costs at a minimum, good roads are necessary and Hanna is convinced that road treatment is well worthwhile.

In his discussion, Briscoe pointed out that operating records at the Ayrshire Collieries Corp. show the 32-ton coal haulers, equipped with 200-hp diesel engines as their most economical haulage units on a cost per ton mile basis up to a distance of 2.7 miles one way. For greater distances, 40-ton and 45-ton haulers, with 300-hp diesel engines, have proven more economical. Ayrshire units are equipped with single tires and the company is convinced that this is the thing to do. Ayrshire management also is thoroughly convinced that tire cost per ton mile can be reduced by proper, well supervised, maintenance programs.

The company has developed a tire "buggy" to expedite changing or installing truck tires. With it, one man can change a tire in less than two

hours. Also considerable experimentation has been conducted by Ayrshire in developing a method for repairing cuts to large single tires without dismounting.

In discussing Hyslop's paper, Dress described a number of 40-ton units that United Electric Coal Cos. installed as originally having 275-hp engines which average approximately 2300 hr of life before overhaul. Horsepower was increased to 300 and the engine life was up to 3000 hr. A torque converter with hydraulic transmission was installed in one truck and over the period of a year's use, this unit required 40 percent less repair than other units with standard transmissions. However, because of its slower speed, one or two trips a day were lost.

Dress also remarked on the higher tire costs encountered with high speeds. With tire costs averaging 35 percent of total maintenance, United Electric Coal Cos. has slowed down units to a top speed of 32 mph by changing the fuel pump governor on the engine. The result of this move has been a marked decrease in repair time.

Auger Mining

"The Coal Recovery Auger—A Modern Mining Tool" was the subject of the next two papers. Kenneth O. Shaner, assistant to the vice-president, Mech Mining Co., described methods in western Pennsylvania and D. A. Zegeer, assistant to the president, Consolidation Coal Co. (Ky.) described eastern Kentucky methods.

Shaner pointed out that where there is a barrier of coal along the highwall, which permitted drilling to a depth of 48 ft or more, it is profitable to recover this coal by auger mining. Mech Mining Co. recovers considerable coal by this method in the upper Freeport or E seam near Kittanning, Pa. Most of this coal is 36 to 40 in. high. Much of the highwall has to be prepared for auger mining by cleaning to a full cut width of 40 ft. Parallel holes are drilled to face 196 ft deep. Each hole produces 40 tons of coal or five tons per 24-ft auger section. Pillars 5 to 12 in. thick are left between holes.

To drill a 30-in. diameter hole 196 ft deep requires one hr. The machine is moved into position for the next hole in 15 min and thus a complete cycle requires one hr and 15 min.

Zegeer reported that outcrop coal is loaded, by the Consolidation Coal Co. (Ky.), into dump trucks and hauled a maximum of four miles before it is loaded into ten-ton mine cars. From the various loading points, the coal is hauled through the underground workings to a preparation plant. The slope of the hillside in this area is approximately 30° and eight cu yds of overburden are moved for each ton of coal loaded. The auger crew consists of three men, two operating the auger and the third hauling the coal to the mine car loading point. The operation is on a small scale because of the limited amount of highwall.

Augers from 24 to 36 in. in diameter have been used for various heights of coal benches. An average of three holes are drilled per shift, producing 0.3 tons per ft with a 37-in. head. Average production is 30 raw tons per man shift with a 10 percent reject. Auger sections are six ft long. Two or three min are required to drill a section length and it takes 45 seconds to retract and add a new section. A maximum of 20 augers are used in drilling holes 123 ft deep.

The final paper at the session was presented by John W. Davies, blasting engineer, Shen-Penn Production Co., who talked on anthracite stripping in burning areas. Full text of this paper can be found on pp. 67 to 70 of this issue.

Mechanical Mining

On Tuesday morning R. G. Pfahler, consulting mining engineer, Berwind White Coal Mining Co., presided over the mechanical mining session in the Pavillon Caprice. The first subject treated at this session was that of Face Preparation Methods. Speakers from Wyoming and Pennsylvania described different phases of the face preparation cycle.

D. C. Howe, industrial engineer for Jones & Laughlin Steel Corp., described his company's experience with hand-held, hydraulic drills. At one mine, an improvement of about 15 percent in production per face man day has been recorded since the hand-held hydraulic drills were first put into service in June, 1953. Savings on operating labor alone repaid the investment in drills in less than two months' time.

Howe also said that the reduction in maintenance costs is considerable, as the part-time services of one man have been sufficient to keep the hydraulic drills at this mine operating satisfactorily. Employe safety is greatly improved and some of the dangers frequently associated with the drilling operation have been eliminated.

Robert Yourston, resident engineer, Union Pacific Coal Co., spoke on face cutting with a rubber-tired Universal machine in steeply pitching seams. All coal is undercut in the Stansbury district because of the uneven manner in which the coal breaks from the bottom. In addition to the undercut, a centercut, topcut or shear is made, depending on local conditions.

The effect of the 15 to 30 percent pitch on the machine operation has been particularly noticeable in the tramming operation. In a strike room the machine can move at the rate of 185 fpm in high gear. Tramming speed up the grade is made in low gear at about 35 fpm. On particularly severe grades it is often necessary to back the machine up the pitch, which places more machine weight on the driving wheels. This reduces the speed of tramming to 28 fpm.

F. F. Stewart, superintendent, Jewell Ridge Coal Corp., described complete mechanization in a five-ft



Strip Mining Session in South Hall was crowded with interested listeners

seam. There are two methods of service haulage used at the Omar mine: shuttle cars on four of the sections and "piggy backs" or bridge conveyors on the remaining sections. All sections use mechanical loaders and rubber-tired cutting machines.

Loading machine idle time while waiting for shuttle cars has been greatly reduced by adding sufficient capacity to fill a mine car to each shuttle car. The 15 seconds saved at the loading point on each shuttle load, plus the 20 seconds additional at loading machine to load the extra ton of coal into the shuttle car, makes shuttle service as nearly continuous as possible.

A minimum of lubrication is done by the repair man on shift and a maintenance crew of two men take over on each section on the third shift to give all equipment thorough lubrication. These men also make necessary repairs, as designated by the shift foreman. This procedure has kept on-shift breakdown to a minimum and has been a great factor in improving performance.

"Piggyback" or bridge conveyors were acquired to work on top of the false bottom to provide more continuous operation for loading machines and to reduce maintenance costs.

Over-all performance and gradual improvement in a concentrated working area with loading machine and "piggyback" conveyors indicate a great potential for this method both in conventional mining under favorable conditions and as service haulage for continuous mining. Unusually high capacity, not generally associated with conveyor mining, has been achieved.

Stewart's paper was followed by a symposium on the efficiency of large versus small crews for mechanical mining. Taking part in this symposium were H. W. Bauer, division manager, West Virginia Coal & Coke Corp., Joe Craggs, field superintendent of operations, Peabody Coal Co., and G. S. Jenkins, president of the Clarkson Manufacturing Co.

Bauer pointed out that each mining property presents a different problem and that many variable conditions such as seam thickness, type of equipment and tonnage mined affect the size of underground crews.

He described the practice of his company operating in the 44-in. upper Island Creek seam and said that the real formula for determining the number of men per crew in the case of the West Virginia Coal and Coke Corp., is dictated by their experience from the standpoint of mining costs. Their accounting indicates that they must average 19 tons per crew-man day at the mine under discussion to show reasonable profit.

While it is true that the investment cost for mechanical equipment cannot be overlooked, Bauer said, it is usually considered in the light of tonnage reserves available to the mining operation. If careful and proper planning is used, the cost of equipment is then considered in terms of cents per ton of reserves rather than on a day-to-day basis of production costs.

Joe Craggs, field superintendent of operations, Peabody Coal Co., in commenting on the general topic of the efficiency of large crews vs. small crews for mechanical mining also pointed out that the choice of method and number of personnel depends on local conditions in every case.

Operating in the central Illinois field where the coal varies from six to eight ft in height, his company operates a "large" unit consisting of one loading machine, one universal cutting machine, two or three cable shuttle cars, two rubber tired, double arm, electric rotary drill jeeps, two men shooting with airdox on shift, one repairman, one brattice or timberman, one clean-up man, and in some cases two roof bolters. A large organization is built around the loading machine, which is kept operating at its maximum tonnage up to the point of diminishing returns. Top loading time is about 60 percent of a workable shift and up to 66 percent in their all-belt mine.

For the 700 to 900 tons per large unit, two shuttle cars are a minimum and when the average hauling distance is 400 to 500 ft, the working machine is operating 45 to 60 percent of the working shift. To use the productivity of machinery to its greatest advantage, a rather large crew is therefore necessary, but small crews do have their place in the operation.

In all mines, whether in high or low coal, the system should be flexible to take advantage of any situation which might arise.

Jenkins contributed to the symposium from the viewpoint of the manufacturer with many years' practical operating experience. "The widely varying conditions," he said, "encountered in different fields make it impossible to draw any definite conclusion on this question of size of crew."

He presented analyses of three possible situations, all apparently identical in many respects, but with different numbers of men in the crew and consequently a different requirement in the amount of equipment needed. First of these was an 18-man crew producing 800 tons per shift and requiring a total of $150,000 worth of equipment. Such a crew, he thought, could produce coal at a cost for labor and depreciation of 49½ cents per ton. In the same seam, a 10-man crew producing say 400 tons per shift and using only $100,000 worth of equipment, other conditions remaining the same, could produce coal at a cost per ton for labor and depreciation of 57 cents. Again with other conditions remaining equal, but using a six-man crew to produce 300 tons per shift would require only about $75,000 worth of equipment and the cost per ton for labor and depreciation would be 50 cents. These three cases were purely hypothetical, but meant to apply to the Illinois No. 6 seam.

Whereas in the case of the seam referred to by Bauer, the coal seam is only 44 in. thick and about twice as many working places are needed for a given tonnage. This would mean that a capital investment of approximately two times that required in the Illinois No. 6 would not be out of line.

Coal Preparation

On Tuesday morning another session had to do with coal preparation. G. R. Watkins, general manager, United States Fuel Co., served as chairman and J. B. Morrow, consulting engineer, Alford, Morrow and Associates, presented the first paper. He outlined the effect of future markets on coal preparation.

Morrow advanced the opinion that preparation plants furnishing coal for public utilities would tend to have more simplified and less costly flowsheets in the future. There may be a tendency toward more air cleaning of fines for this market, even with some preliminary heat drying. On the other hand, the market for metallurgical coal, in many cases would tend to become more critical of sulphur and one can expect still further refinements in coal preparation for that market, particularly in the case of the high sulphur coals.

In discussing the preparation of minus ⅜ in. coal for the electric utilities and the iron and steel industry, it was brought out that cleaning by itself, while it improves, does not always guarantee a uniform product and a uniform product is important.

J. E. Tobey, president, Appalachian Coals, Inc., pointed out that there is no simple "yes" or "no" answer to the question of whether or not to clean minus ⅜ in. coal for steam generation purposes. Tobey went on to say that he believed there is an undercurrent in the form of a consistent demand for better preparation of the fine sizes in the minus ⅜ in. category brought about by higher furnace temperatures in large utility boilers. Tobey decried the selling of coal on a cost per million Btu's delivered basis, with a total disregard for many plus values and nuisance values.

I. V. Curtis, chief electrician, Midwest Radiant Co., described "Sludge Recovery at Midwest Radiant Plant." He told how minus ½-mm material formerly wasted is now being recovered. This material is the underflow from shaking screens used to dewater clean coal coming from Baum jigs. The underflow, containing about 30 percent ash, is tabled, dewatered and allowed to drain, then heat dried to

produce a final product with a 12,816 Btu value and 10.72 percent ash, moisture free. This fine coal plant has justified itself by recovering over 100 tons of fine coal per shift in addition to well over 50 tons of tramp coal which would otherwise be thrown out.

"Heavy Media Washing in the Pocahontas Coal Field" was the title of the next paper. Prepared by A. E. Sadler, assistant chief engineer, and J. W. Forman, preparation engineer, Pocahontas Fuel Co. The paper described the heavy media process at Pocahontas Fuel Co.'s Itmann and Amonate mines.

At Itmann all coal is crushed to minus 6-in. and separated into 6 by ¾-in. and ¾-in. by 0 sizes. The larger size reports to the heavy-media washery, the minus ¾-in. to the drying plant to be prepared for dry cleaning. After drying, 2¼-in. by 1¼-in. is conveyed to the heavy media plant and the minus ¼-in. to the dry cleaning plant. The wet washing section of the plant employs three heavy media concentrators, using magnetite to maintain heavy density. The No. 1 concentrator receives ¾-in. by ¼-in. raw coal, producing a clean coal and a refuse product. The No. 2 concentrator handles the 6-in. by ¾-in. raw coal. The separation produces two products, a final refuse and a float product to be retreated in the No. 3 concentrator. The No. 3 concentrator yields a clean coal product and a sink product which is crushed to minus 2-in. and may be loaded as power plant fuel or recirculated to the raw coal shaking screens.

Water is clarified in a 50-ft settling cone with a capacity of 2500 gpm containing 5 percent solids. A portion of the wash water is diverted to a large settling pond to settle out clay slimes.

At Amonate the coarse coal washing plant handles 160 tph of 7½ by 1¼-in. raw coal. The 1¼ by ⅜-in. coal is washed in jigs and the minus ⅜-in. is conveyed to the fine coal preparation plant. There are two intermediate concentrators at Amonate. No. 1 handles the entire 7½ by 1¼-in. raw feed. Refuse is treated to recover the magnetite and then conveyed to refuse bins. Float is screened into two fractions: a 3 by 1¼-in. clean coal and a 7½ by 3-in. float fraction, which constitutes the feed to the No. 2 concentrator. The No. 2 concentrator float reports as clean coal. The sink is a middling product which is crushed to minus 3-in. After screening at ⅜-in. round equivalent, the 3 by ⅜-in. crushed middlings is recirculated to the No. 1 concentrator, the minus ⅜-in. middlings being conveyed to the fine coal preparation plant.

DeWitt C. Snyder, vice-president, Mount Hope Coal Co., followed with a paper on "Heavy Media Coal Cleaning in the Sewell Field." Because of wide ash variation in the raw coal feed and the wide range of specific gravities of refuse material, a heavy-media system was installed to clean Sewell coal. At the cleaning plant run-of-mine is crushed to a top size of 7-in. The ¼-in. by 0 slack is removed and the 7 by ¼-in. fraction sent to a dense media separator vessel after pre-wetting. A near theoretical separation is made; less than one percent coal in the sink or reject product and less than one percent sink or reject in the coal or float product. Currently the company is washing an average of 80 percent of the finished product at a raw coal rate into one separating vessel of 200 tph. Separation is at 1.32 sp. gr. and original ash content of from three to 50 percent in the run-of-mine to an average below 2½ percent in the wash coal.

H. F. Yancey, M. R. Gere and U. K. Custred of the U. S. Bureau of Mines combined to prepare the final paper on the morning program, "Feldspar Jigging for Cleaning Fine Coal." Feldspar, or artificial-bed jigging, refers to the practice of using a false bed of heavy material on the jig-screen plate to prevent light material from going through the screen into the hutch. In other words, material is washed through the screen in contrast to the common practice of washing over the screen in jigs in this country. Experiments by the USBM at Seattle, Wash., on an extremely fine coal in a single compartment Feldspar jig showed an efficient separation of the feed down to 48-mesh. The experience leads the authors to believe that better washing results and high capacity per unit area could be obtained with full scale equipment.

Feldspar jigs are used almost universally for fine coal cleaning in Europe. Although their economic value is not yet known, such jigs require a minimum of plant space and housing based on capacity per square ft.

* * *

On Wednesday morning under the chairmanship of Ralph E. Kirk, Manager of Raw Materials, Tennessee Coal & Iron Div., U. S. Steel Corp., another session was held on Coal Preparation. The first speaker of the morning was W. A. Weimer, chief engineer, Northern Illinois Coal Corp. His topic was "Reject Disposal by Pump and Pipeline." The full text of his paper appeared in the April issue of MINING CONGRESS JOURNAL.

Going from pipe line handling of reject disposal to handling with truck, conveyor and aerial tram as practiced in the Appalachian Field, T. W. Guy, Consulting Engineer of Charleston, W. Va., was the next speaker. Guy's paper summarized and compared the refuse disposal methods of ten plants. For the ten plants the average cost of labor employed in refuse disposal was $.0068 per ton for one group and $.1519 per ton for the other. It was pointed out that changes in underground conditions or methods in a given mine may increase or decrease the cost of operating labor for refuse disposal through a wide range. The fact that such wide variability occurs between different plants and at different times for a single plant, emphasizes the importance of constant vigilance in watching not only the operating labor cost of refuse disposal but also the maintenance and capital costs.

Systematic piling will make it possible to recover coal from a refuse pile when maximum demand and maximum prices make it worthwhile, whereas,



Itmann preparation plant of the Pocahontas Fuel Co.

careless handling may actually encourage the starting of a fire with consequent increased costs, nuisance value, and more loss of the coal it contains.

Richard A. Mullins, chief chemist, Ayrshire Collieries Corp., outlined a program being carried on at the Ayrshire Collierie that his company plans to keep coal losses in the washery to a minimum. This program, he said, consisted of three main points: (1) Plans formulated for a new plant provide a sufficient size to insure adequate capacity; (2) Continued maintenance and replacement of worn equipment to give best possible washing efficiency; (3) A laboratory control program supplying information necessary for continuous operating conditions.

Although maintenance crews at Ayrshire are similar to those employed at other preparation plants, a record is kept of maintenance work performed. If a unit is serviceable when inspected but shows signs of wear, its exact condition is noted. The repair can then be planned for when needed. Trying to get the most wear out of a piece of equipment can be false economy. As an example he cited a new centrifugal which was installed with good results for as many as ten shifts on a single screen. However, checking the amount of coal in the effluent gave results that were not satisfying and the screens are now changed after six or seven shifts. Previously, as much as $150 worth of coal was being discharged in the washery wastes due to worn screens for each of the three extra days.

Recovery of coal through the reduction of washery wastes is not limited to reduction of the float in the refuse after plant is erected. It is inseparably related to the planning, the maintenance and the operation of the plant. There is no shortcut to knowledge of the operation of the unit. It has to be sampled and tested by competent personnel. The washing plant of the Ayrshire plant alone rejects well over a half million tons of refuse yearly. A change of but a small percentage of recoverable coal in the waste will more than pay for the whole laboratory system.

R. A. Lewis, chief engineer, The Carbon Fuel Co., seconded the three-point program presented by Mullin. He warned, however, that there is an economic limit beyond which it is not profitable to try to recover the fines. In these days of full seam mining everything underground comes to the cleaning plant and much of that isn't coal but slate, rock or dirty fines.

He pointed out that uniformity of size and chemical analysis of coal delivered from the washery is directly dependent upon the uniformity of size, moisture and chemical analysis of the coal fed to the washery. The use of different methods of mining and types of equipment also affect uniformity of the product. Often this uniformity is even more important than a very low ash, sulphur or moisture content. Making a conglommeration of material that reaches the washery marketable may cost more than it is worth at times.

Right in line with the cleansing of coal operation is the problem of eliminating stream pollution. Henry F. Hebley, research consultant, Pittsburgh Consolidation Coal Co., was next on the program. He said that the new techniques developed in America's industrial economy have increased the demand for water fantastically and an adequate supply of good water per capita of population is increasingly difficult to procure.

The Ohio River Valley Water Sanitation Commission has listed nine different uses, all of which receive consideration in the allocation of water: (a) Potable water supplied for domestic use, (b) aquatic life, (c) recreation, (d) industrial water supply, (e) power development, (f) navigation, (g) weight carriage, (h) scenic and aesthetic qualities, (i) agricultural and animal husbandry.

The mining industry is but one of the many users of water but it is often accused of being the most serious "polluter" of our streams. It has been very active in seeking the answers to the problems of preventing the formulation of acid mine water and to the abatement of stream contamination generally.

There is a continual pressure on various legislatures to adopt laws "with teeth in them." However, Hebley said, if industry can seize the initiative and have available correct authentic data that can form the basis of equitable legislation there is every possibility that regulatory officials would be cooperative in working with the mining industry.

Atomic Energy And Coal

At Tuesday's luncheon, Ralph K. Gottshall, president, Atlas Powder Co., and chairman of the Manufacturers Division of the American Mining Congress, presided. Principal speaker was Walker L. Cisler, president, The Detroit Edison Co. Cisler spoke on "Atomic Energy and Its Industrial Applications." He said that the coal industry and its largest customer, the electric power industry, will probably be inseparable for many years to come, even if the use of atomic energy in the operation of steam-electric generating plants becomes feasible.

Cisler said that, in his opinion, the need for coal for power generation would continue at increasing levels for many years to come. "The adverse effects of atomic fuels on the coal industry seems to me to be far in the future, and very likely in any case, will be offset by future changes in the energy situation."

He noted that in 1953, the electric power industry used about 116 million tons of coal, 1032 billion cu ft of natural gas and 82 million bbls of oil. This is the total equivalent of about 177 million tons of solid fuel. Forecasts based on increasing power requirements indicate that present demands for coal for power generation will go on increasing. By 1965 the nation's total thermal electric generating capacity will have risen from the present 69 million kw to between 150 and 175 million kw, he predicted. Thus by 1965 the nation's power plants may be using as much or more than 250 million tons of coal annually as compared to the present 116 million tons.

The full text of Mr. Cisler's address appears at pages 30 to 33 of this issue.

Human Engineering Described

A strip mining session was held Tuesday afternoon under the chairmanship of Edwin R. Phelps, vice-president, Pittsburg & Midway Coal Mining Co. The first speaker of the afternoon was Thomas M. Ware, vice-president, Engineering Division, International Minerals and Chemical Corp., who spoke on "Bigger Returns from Larger Stripping Equipment." Ware advanced the idea that mining equipment, particularly strip mining equipment, will become larger and more complex, putting more responsibility in the mine equipment operator's hands. There is a limit to how large and cumbersome mining machinery can become unless the efficiency of the equipment can be maintained by giving more consideration to the machine operator, Ware stated. In his opinion there is a great area of opportunity here for the equipment manufacturer.

At International Minerals and Chemical Corp.'s Bartow, Fla., phosphate mines, complete consideration of the one man who must operate a million dollar walking dragline has been realized in a new type control center. The control cab is air conditioned and equipped with an array of control information on a panel in front of the operator to help him do his job better. Ware feels that sooner or later all modern large production mining and construction equipment will embody these design principles to help get lower costs. The operator of a large piece of mining equipment is a most vital man in the mining operation and should be given every advantage needed to perform his job well.

J. W. Woomer, J. W. Woomer and Associates, discussed Ware's paper. He seconded Ware's predictions and urged that every possible assistance be given the pioneers in "Human Engineering" to hasten the day.

"Recent Information on Blasting Vibrations" was the next topic of the afternoon. Jules E. Jenkins, Vibration Measurement Engineers, gave a paper on the subject, which was dis-

cussed by John L. Romig, Technical Division, Atlas Powder Co.

Jenkins brought out that, "with millisecond delay blasting, vibration from blasting was reduced to approximately 50 percent over instantaneous blasting." The analysis of much seismographic data taken in connection with millisecond detonating techniques has resulted in the discovery of the "vibration dip characteristic." Observation shows that with millisecond delay blasting, displacement increases with the explosive weight to a certain point. Thereafter, with further increase in explosive weight, the displacement drops off for a period and then increases again.

This information has resulted in shooting larger blasts in certain jobs to reduce vibrational effects. Analysis of the seismographic records at one job reveal a dip of 62 percent in the displacement curve when the explosive loading was increased from 1350 lb to 2475 lb. The 2475-lb loading had a vibration equivalent of that produced by a blast employing a 400-lb explosive charge. Jenkins went on to say that it behooves all users of commercial explosives to be well fortified with ample seismographic data at all times, which can be effectively employed in the defense of litigation.

In discussing Jenkins' paper, Romig stressed the human element in blasting results. He pointed out that when blasts were shot during the late morning period when housewives were busy, complaints were always fewer than when shooting was done during the afternoon when the housewife was less busy. Although many blasting effects are imaginary to the property owner, every operator must stress public relations and try to reduce blasting effects on the surrounding countryside.

Strip Haulage Roads

R. H. Uhl, Mining Engineer, W. G. Duncan Coal Co., wound up the afternoon with a paper on "Strip Mine Haulage Roads." Uhl pointed out that most of our nation's highways are designed for a maximum axle load of 18,000 lb while coal haulers have axle loads up to 40,000 or 50,000 lb.

To assure good haulage roads there are three phases of road building to be considered: (1) planning; (2) construction, and (3) maintenance. Planning will dictate the road route and establish proper grades for the trucks which are to use them. Proper construction cannot be over-emphasized and proper maintenance will insure good roads.

At the W. G. Duncan Coal Co. 60 ft wide road beds are constructed with from one to three ft of special base material to make an impervious layer to keep water out of the sub-base. Materials most generally used are shale from the strippings and refuse from the preparation plant.



Good haulage roads depend on planning, good construction, and faithful maintenance

At one mine in west Kentucky, a three-in. bituminous concrete surface is used. A surface using only ¼-in. by 0 limestone on top of the sandstone spoil bank is in the experimental stage at W. G. Duncan Coal Co. This surface about three in. thick has held up well for about two years. Another experiment using a ¼-in. by 0 crushed rock as resurfacing material is under way. This makes a smooth surface, easy to grade, and seems to be less dusty than the larger rock. Dust on rock haulage roads is controlled with water distributed by truck borne sprinklers. During the severe winter of 1949-50, many country roads in west Kentucky broke down and some became impassable. However, at no time during this entire winter did W. G. Duncan ever have to cease strip operations because of poor haulage roads.

Underground Haulage

On Tuesday afternoon under the chairmanship of C. R. Bourland, vice-president, New River Co., the general subject was underground haulage. R. U. Jackson, manager, Mine Conveyor Sales & Development, Hewitt-Robins Incorporated, led off with an illuminating talk on Belt Conveyor Maintenance. "The beginning and ending of proper belt conveyor maintenance is good housekeeping," he said. "This does not mean the cleanup of a conveyor line once each month or two, but it means maintaining a clean conveyor system at all times."

A trained maintenance crew should be as much a part of the installation of a new belt conveyor as the belt itself. Actually, maintenance begins with the selection of the equipment and belt, which should be properly designed for the service required.

The fire hazard must always be considered as an important factor in mine conveyor design and proper electrical control equipment is absolutely a must. He suggested seven points which should be followed in designing the control system for a belt conveyor system. These are: (1) Connect each drive to the line through stepped resistance. (2) Start all drives in sequence, with the outby drive starting first. (3) Automatically stop following belts if any belts should halt for any reason. (4) Stop all inby drives if any belt receives an overload of coal. (5) Arrange control of each conveyor for independent operation when repairs or adjustments are being made. (6) Provide a continuous stop control along the entire length of the belt system of the pull-cord type, so the belt man can immediately stop a damaged belt or one where possible damage is indicated. (7) Provide a drive pulley slippage control that will open the circuit of the drive as soon as belt speed is reduced due to slippage at the drive pulley.

J. W. Hardy of the Goodman Manufacturing Co., in commenting on Mr. Jackson's talk on belt conveyor maintenance, agreed with him as to the importance of housecleaning and stressed the importance of having a properly trained man in charge of belt conveyor operation and maintenance. He pointed out that a belt conveyor may cost from $100,000 to $200,000 and as such an expensive piece of equipment, it deserves the utmost in care. Conveyor manufacturers are willing and able to train an intelligent belt crew for the mining company.

In choosing a belt conveyor, study the specifications carefully with maintenance in mind. Consider the maintenance cost over years of operation against a few dollars cheaper first cost. Also make sure the equipment is adequate for the job. Do not overstress the belt nor strain the electrical system.

With sufficient belt footage in operation, a repair shop with trained crew and belt storage house at the mine should be considered. Failing this, send belts out to a reputable repair shop for major repairs and discuss belt problems with the manufacturer. In closing he pointed out that a dollar spent on preventive maintenance is the same as a dollar spent on preventive medicine. They both will help you keep going when you most need tonnage and health.

Passing from belt haulage to shuttle car haulage to mine cars, Thurman C. Harris, Jr., assistant engineer, Ingle Coal Corp., described the shuttle car haulage system now being used at the Ingle Coal Corp.'s Ditney Hill Mine.

Three methods of mine car loading have been used: ramp loading, elevating conveyors and direct loading from shuttle to mine car. The ramp method here is the fastest and cheapest. A one-in. water line feeds three overhead sprays at each ramp for dust control. Each ramp is equipped with signal lights, controlled by the shuttle car operator to direct the motorman handling the mine car trip.

The elevating conveyor is used where natural seam grades would make bottom grading for a ramp impractical. The elevating conveyor is placed at 90° with the track in the mine floor deep enough to form a small hopper and a wooden runway is built up to the conveyors.

Where a small development is to be made, two cable shuttle cars with elevating discharge are used to load direct into mine cars. The top is shot down to allow clearance for discharging and water sprays and signal lights are installed.

Shuttle haulage roads are treated with calcium chloride to allay dust and to condition the road bed. Steel drags on the cars keep the road bed leveled.

Speeding up shuttle car discharge, shortening shuttle car travel distance and quick trip changes have been most important factors in increasing production from a 12-year average of 3300 tons to the 1953 average of 3808 tons.

C. H. Williams, chief engineer, Red Jacket Coal Co., Red Jacket, W. Va., spoke on "Shuttle Car Loading onto Belt Conveyors in Thin Seams." His paper appeared in the April issue of MINING CONGRESS JOURNAL.

A further step in modernization of haulage systems is the extensible belt for continuous mining. W. J. Shields, chief mining engineer, Rochester & Pittsburgh Coal Co., spoke of such a device as a possible solution to insure adequate haulage behind continuous mining equipment. This company has been using a Joy Extensible Belt Conveyor for the past six months where the seam height varies from 42 to 44 in. The mine has four continuous mining sections and one conventional section with an average production of 2250 tpd of raw coal. Coal is transported from the face discharge points to the outside on a series of 30-in. belts.

The headpiece or drive of the extensible belt is mounted on crawler treads and can be trammed from one location to another. The conveyor itself is equipped with a 24-in. belt driven by a 15-hp motor and a tandem pulley drive at a speed of 350 fpm. Its rated capacity is 2¼ tpm. Automatic built-in jacks are used to extend or retract the belt by a series of rollers over which the belt is laced. The tailpiece is also crawler mounted and acts as an individual unit, having its own set of controls. The continuity of face production is interrupted each time a 50-ft face advance is made due to the necessity of adding belt. This operation requires approximately 15 min. Belting is added in 100-ft lengths at the back end of the headpiece.

Time studies show that the continuous miner can load 86 per cent of its operating time when discharging directly onto the extensible belt.

Among the tests this company has run, it is apparent that the principal advantages gained by using the extensible belt for continuous miner haulage is a reduction in crew size for about the same tonnage. This, of course, means a substantial saving in face operating costs.

Maintenance and Power

At the Maintenance and Power session held Wednesday morning, H. S. Lowry, chief engineer, Snow Hill Coal Corp., served as Session Chairman. The first paper was presented by Donald M. Smith, superintendent of Shops, Hudson Coal Co., who described the maintenance organization and practices of the Hudson Coal Co. Smith emphasized the necessity of good maintenance in the anthracite industry and also pointed out that maintenance practices differ from those in the bituminous coal and metal mining fields. Hudson Coal maintains a central repair shop consisting of a machine shop, sheet metal shop, blacksmith shop, welding shop, woodworking shop, electrical shop, foundry and pattern shop, machine mining repair division, and rock force shop. These are centrally located and readily accessible by truck or railroad from any of the coal company's operations.

Under normal conditions the shops are expected to be able to cope with major breakdowns, electrical or mechanical, as well as provide for the servicing of shaker units; scraper loaders; car spotting hoists; steam shaft hoists; electric hoists; loading machines; belt conveyors; scraper conveyors; electric locomotives; ventilating fans; steam locomotives; generators; electric motors of all types and their controls; pumps ranging from 50 to 1100 gpm with heads to 850 ft. Each colliery has proper facilities to handle large equipment which can be readily transported to central shops by heavy motor trailer so that it is not necessary to depend on outside haulers. The central repair shop of the Hudson Coal Co. has proven an ideal arrangement.

The next topic in the morning session was underground high voltage cables. The subject was discussed by John A. Dunn, electrical engineer, Island Creek Coal Co. and T. R. Weichel, mine electrical engineer, Hazard Insulated Wire Works Division of the Okonite Co. Dunn, who is also Chairman of the Underground Power Committee of the American Mining Congress, stated that where a high voltage AC distribution circuit is taken inside the mine it should be switched on the outside with a circut breaker of suitable voltage rating in interrupting capacity. Where high voltage circuits enter the mine through shafts or bore holes, a disconnecting device must be provided at bottom of shaft through bore hole.

High voltage lines are difficult to de-energize by open-type line disconnection and there is a danger of arcing which might result in damage or short circuits. Where open-type disconnections are used, it is recommended that a control station be provided for operating the circuit breaker outside the mine. Where the high voltage circuit in the mine is tapped for a branch feeder suitable disconnect switches should be provided near the beginning of each branch.

There are many types of high voltage circuits that could be safely installed but it is the opinion of the American Mining Congress Underground Power Committee that nonmetallic armoured, neoprene jacketed cable with ground wires and shielded power conductors is superior for mining service. This cable in conjunction with a limited ground current system and adequate protective devices provides a high voltage mine system that is safe and well adapted to use.

In discussing Dunn's paper, Weichel pointed out that the power cable described is classified as a shielded nonmetallic armoured cable with neoprene sheath. The cable is flame resistant and meets the flame tests requirements of the Pennsylvania Department of Mines and the U. S. Bureau of Mines. Federal and State regulations govern the installation of neoprene sheath cables in most mines in the country. These rules differ to some degree but basic requirements

are similar in many respects. Weichel pointed out that a metallic armoured cable with steel wire armour is undoubtedly the preferred cable for permanent installation where the cable is subject to damage from falling material or moving equipment in mine shafts. However, where the protection of metal armour is not necessary the neoprene armoured cable is satisfactory and meets safety requirements. Multi conductor cables are preferred for all the AC feeders, especially where high voltage AC is used. Suspension of the cable in shafts is limited to two acceptable methods; (1) supporting the entire weight of the cable by clamping each conductor to a separate strain insulator, and (2) support by clamping the cable to the shaft at intervals throughout its length if necessary.

It is the opinion of the Power Sub-Committee on High Voltage Installation that where high voltage system is grounded and ground current limited and adequate switching and protective devices are used, the above recommended neoprene jacketed cables can safely be installed under the same conditions as metallic armoured cables.

Mine illumination was discussed by Gerald von Stroh, Director of Mining Development Committee, Bituminous Coal Research, Inc. Von Stroh described the results of experiments on mining conducted from October 1953, to March 1954. He pointed out that approximately 212 flourescent circular fixtures were required to provide good visibility throughout approximately one mile of active entries. Equipment, procedures and techniques have now been developed to the point where the lights can be maintained in the proper position with two-man-hours per shift. Cost of supplies average about $2.00 per shift and the cost of equipment, including the motor generator, set, wiring, fixtures, etc. for the present test section will be slightly less than $8000.

Von Stroh pointed out that while area lighting is most helpful in moving machines from place to place it is not of much value in the actual face cutting operation. This requires a high intensity light capable of penetrating dust.

Initially, attempts were made to use 250 volt DC mine current connected with a flourescent fixture. However, satisfactory performance was not available and it was decided to use 110 volt 60 cycle AC current.

Robert Dice, project engineer, Bituminous Coal Research, Inc., discussed von Stroh's paper. He described the day to day problems met and conquered during the lighting experiment. Dice pointed out that dust gathering on light fixtures was not a great problem as it was a simple matter to wipe the lamps off when they were advanced.

Continuous Mining

The convention wound up on Wednesday afternoon, with a session on continuous lighting. G. A. Shoemaker, executive vice-president, Pittsburgh Consolidation Coal Co., served as session chairman.

J. W. MacDonald, vice-president, Old Ben Coal Corp., led off and described his company's limited experience with the two Goodman miners delivered to date. The miner makes a cut seven ft high and 13 ft 2 in. wide at the center, being curved at each end. Retraction of the rotors allows one ft of total side clearance, 8⅝ in. top clearance and 3⅜ in. clearance under the rotor head for tramming.

The first *miner* was placed in operation on March 3, 1954 for development of a six-entry group. In excess of two hundred tons of coal were loaded per average shift during April on this section, exclusive of shale and underclay.

The second machine was placed in operation on April 8 and loaded 43 cars or about 284 tons on the first shift. Production averaged 333.3 tons per shift during the month with 64 to 70 cars loaded in each of three consecutive shifts during the last week for which data are available, providing an average of 438 tons each.

A shuttle car is used as a surge car with two additional shuttles transferring coal to mine cars. Data available to date indicate that there is an average bit cost of $4.32 per ton.

Mining at the rate of six in. per minute provides coal with a content of six-in. lump comparable to that loaded at other nearby mines. When mining at the rate of nine in. per minute, approximately one-third more lump is made. A moderate increase in the ratio of desirable sizing above three in. is shown for the faster rate of advancement also.

MacDonald emphasized that the two machines had not been in operation a sufficient length of time to give final figures and that all mining so far had been in entries.

E. M. Pace, vice-president of Inland Steel Co., described operations of the Jeffrey Colmol in eastern Kentucky for piller mining in the Elkhorn No. 3 seam. A Joy pick-up loader follows the miner and two shuttle cars transport coal to the mine cars. Roof is bolted intermittently. In the original projections, rooms were driven on 50-ft centers at 60° angles to the entry and break-throughs were 75 ft apart parallel to the entry. Several objections to this projection were found and one more favorable to pillor recovery was devised.

In the new plan, sets of rooms were driven 75 ft apart to establish a pillar 250 by 58 ft. The 58-ft pillars were completely mined by lifts 70 to 80 ft long made open and about 40 to 65° angles with the rooms.

Roof on these sections is bad and proved troublesome while working with conventional equipment. While mining with the Colmol, however, no shocks were transmitted to the tender roof and it was undisturbed. Extraction progressed at such a rate



Mine lighting experiments indicate lower mining costs through improved visibility

that the roof remained intact. A fall did not usually occur until 200 ft in the 250-ft block where coal had been mined and the lift started up the back side of the last 50 ft of the block. Pace stated that coal was mined by the Colmol much safer and cheaper and with less rock handling than would otherwise have been possible with conventional equipment.

A second plan for use in a section having a better roof has been devised. Entries are driven on 65 rather than 56-ft centers. The 75-ft room centers were retained because it was deemed unsafe to drive open end lifts more than 80 ft long. Shuttle car loading platforms were located only 125 ft apart.

Four years' experience with the Joy continuous miner was described by R. C. Graham, superintendent, Saginaw Dock & Terminal Co. The company is mining in the Fittsburgh No. 8 seam in eastern Ohio, where, because of roof conditions, pillars are not extracted. Overburden is from 200 to 400 ft. Crews for room mining are made up of two timbermen, two shuttle car operators and one continuous miner operator. The room is timbered with four-in. H-beams set on posts. H-beams are raised in place by hydraulic timber jacks on the miner and posts are set under each end. Production averages about 250 tons per shift. Dust developed by the continuous miners combatted the use of five high pressure fog nozzles—two on the inside and two on the outside of the cutting head and one at the hopper. Approximately eight gpm of water is used per ton of coal. During four years' operation with continuous miner, 1,745,569 tons of coal have been mined without a fatality by Saginaw Coal and Dock Co.

R. C. Beerbower, Jr., superintendent, Karen Mine, United States Steel Corp., described the Konnerth Mining Machine. The first unit was put to work in the Karen mine in September 1952, operating in the Pittsburgh seam. By September 28, 1953, 12 units were working on development. By the end of 1953, they were producing 4000 tons a day. This tonnage is being maintained.

Standard sized crew on this unit is four men; one operator and three helpers. To describe a face cycle, first assume that the working place has been properly roof bolted and three holes in the face have just been "popped." The face is cracked and a portion of the coal is dropped to the mine floor. Machine picks up the loose coal by advancing to the face trimming the roof with the hammers on the way. When the solid face is reached the shear bars are raised to the desired mine height and the undercutting bars are positioned at the bottom. The machine then advances approximately 4½ ft. When the forward advance has stopped, the shear bars are brought down from the raised position until the shear cut is complete from top to bottom. The machine is then moved to the right side of the face and the same procedure is repeated. When the cut is completed the machine moves back from the face, the crew divides into teams and simultaneously install the roof bolts and drill three shot holes in the face coal. After the three holes are tamped, they are shot one at a time. The cycle is now completed and another one is started immediately.

In summing up his experience, Beerbower mentioned the following advantageous features of using the machine: A repetitious face cycle provides maximum safety for the crew. It is adaptable to present day mining systems for development as well as roof extraction; a minimum amount of dust is put into suspension; the machine is designed to load from the mine floor and maintain clean working conditions, and only eight percent of the coal is cut to bug dust with the bits.



Continuous Mining Session had an attentive audience

The next speaker on the program was C. B. Tillson, Jr., mining engineer, Crucible Steel Co. of America, who spoke on the development of the Lee-Norse Miner at Crucible Mine, operating the Pittsburgh seam in southeastern Pennsylvania. The coal height varies between 90 and 96 in. Since mid-1951, three models of the Lee-Norse machine have been experimented with. The first machine was mounted on rubber tires but later models have been mounted on crawlers. The cutting width has been reduced to seven ft 6 in. so that a 15-ft face can be efficiently cut in two passes. Various methods of coal transportation have been tried and the company is now using a pick-up loader and two shuttle cars to handle mined coal. The size of the coal is nearly the same as produced by standard mobile units where coal is blasted. The most recent detailed survey of the replacement parts for the machine showed a cost of 41 cents per ton. However, it may be assumed that this cost will gradually decrease as bugs are worked out.

F. R. Zachar, general superintendent, Christopher Coal Co. described the operation of the Marietta Miner in the Pittsburgh seam in northern West Virginia. In mining over 80,000 tons, leaving only "shell" pillars between rows, the Christopher Coal Co. has experienced only one fall at the face. This was due to a slip and would have occurred regardless of machinery. They had originally planned to roof bolt rooms in conjunction with the miner. However, this was found to be unnecessary as a natural support is given by the face cutting pattern of the Marietta.

As high as 800 tons per shift have been produced with a six-man crew. Sulphur intrusions in the coal seam affect coal production to a great extent. When mining with conventional equipment these intrusions caused little difficulty but with continuous mining they cause excessive bit costs to the point where at times it is not profitable to operate the machine. These intrusions cause the company to revise their thinking as to projecting for continuous mining. They believe that since they do not know and cannot accurately forsee when seam conditions may change, they must use a mining system which can be worked with either continuous or conventional methods.

Two years' experience with long face mining was described by W. D. Hawley, division manager, Eastern Gas & Fuel Associates and John S. Todhunter, mining engineer, Barnes & Tucker Co. Hawley described performance with the Loebbe Planer in the Pocahantas No. 4 seam of southern



Land and Water Use Committees met at lunch on Wednesday

West Virginia. In a 31 to 36-in. coal seam, 51,450 tons of clean coal were mined out in 93 working shifts, giving an average of 559 tons of clean coal per shift through the first experimental panel. Subsequent panel mining has proved just as successful. Hawley stated that the company, with two years' experience behind them in planer mining, still feels that a great deal is to be learned in roof control. He went on to say that the system has excellent possibilities but it is not a panacea to all mining problems. On the contrary, the planer appears more restricted in this application than other mining units.

Since its installation at Barnes & Tucker Co.'s Lancashire Mine, a Sampson stripper has mined two blocks of coal; the first 270 ft wide by 1300 ft long; the second 400 ft wide by 460 ft long. A third place, 300 ft wide by 11,300 ft long has just started operation. In the face operation, the coal, averaging 38 to 42 in. thick, is sheared by the hydraulically driven blade of the stripper which wedges and loads a 24 to 30-in. slice of coal at a rate of three to four fpm. A conveyor delivers the coal from the face to an entry belt. Since no lateral parting exists in the seam, one is made by pre-top cutting with a Sampson cutting machine mounted on the conveyor. This is done while the loading goes on in an effort to eliminate a cutting-loading cycle. An operating crew consists of 10½ men.

Roof support consists of a single row of two by two-ft prefabricated chocks on five-ft centers and six by 24-in. hardwood blocks. Dowty hydraulic props are spaced between the chocks on four-ft centers. Experience has shown that a strong break line kept close to the face will allow good roof control.

In mining two blocks of coal with the Sampson Stripper it has been shown that the long wall can successfully be done in the Lower Kittanning seam. With initial experience proving the system, the problems now confronted are those of improvement to obtain maximum tonnage.

Fun Too

Every session was well attended by coal mining men as well as representatives from other branches of the industry, all intent on how best to solve the problems they have been facing during the past year and which may come up during the months ahead. But after the serious business of the day was out of the way, everyone enjoyed the regular entertainment functions and the numerous impromptu parties and visiting that are so much a part of Mining Congress Conventions.

On Monday night the cool weather necessitated shifting the Coal Miners' Party from Cincinnati's famous Coney Island to the Pavillon Caprice at the Netherland Plaza Hotel. In spite of the short notice the appointments and the show were top notch.

One of the surprises of the evening was the chorus number in which 12 members of the audience were pressed into service as dancers and a prize awarded for the best performance.

On Tuesday night cold weather again interfered by causing the postponement of the ball game scheduled for the traditional "Baseball Nite." The disappointment of those who had intended to be present at the ball game was short lived and the evening was spent visiting back and forth, making new friends and greeting old ones.

On Wednesday night the Annual Banquet was an outstanding success. The Purdue University Glee Club and Marian Spelman, more than lived up to expectations. Arthur Lee Simpkins, the young tenor, who was a favorite with the Mining Congress crowd at Seattle last September, again outdid himself, as a true artist, with a marvelous voice and superb showmanship. This was an evening that will long be remembered by all those present.

Special Ladies Program

For the ladies the 1954 AMC Convention was a continuous round of pleasure. On opening day at the Get-Together Luncheon the mind reading achievements of the "Mental Wizard" were enjoyed by all. His feats were a topic of conversation throughout the convention.

Despite the cool weather, on Tuesday, many of the ladies embarked on the good ship "Congress Queen" for a ride up the beautiful Ohio River. It was difficult to tell whether they were more enthusiastic about the scenery along the Ohio, the excellent luncheon or the music of the organist who entertained them all the way.

On Wednesday, at noon, the ladies took over the Hall of Mirrors for a luncheon and style show put on by Shillito's, of Cincinnati. This was enjoyed to the utmost by those who



The ladies enjoyed a ride on the beautiful Ohio

attended and also by the men who congregated on the balcony overhead to view the proceedings.

Land and Water Use Committees Meet

The Land and Water Use Committees of the American Mining Congress and the National Coal Association held a luncheon meeting on Wednesday. Here a full agenda was disposed of as members of both organizations discussed the problems of land use, water and air pollution in connection with mining and pledged the cooperation of the mining industry in reaching equitable solutions of problems concerned with the proper use of our mineral resources.

Manufacturers Division Meets

On Monday afternoon, the Manufacturers Division held its regular meeting.

Julian Conover, executive vice-president, reported on the status of the Manufacturers Division activities during the past year and plans for the future. Howard I. Young, president of the American Mining Congress, addressed the group and expressed his pleasure at having this opportunity to meet with the Manufacturers Division. He discussed current conditions in the mining and mining equipment industry in the light of the highly competitive situation that exists throughout all industry today. In pointing out the importance of a proper trade and tariff policy on the part of the Federal Government if we are to maintain a strong mining industry in this country, he emphasized that we are not a "have-not" nation and predicted that with intelligent development work and a favorable governmental climate, additional mineral reserves will continue to be discovered and brought into production. He paid special tribute to the manufacturers and their engineering staffs for the gains in productivity and increased efficiency in the mining of coal, metals and nonmetallic minerals.

A nominating committee for candidates for election to the Board of Governors submitted its report and the following were elected as members of the 24-man Board of Governors: E. G. Brown, vice-president, U. S. Rubber Co.; R. K. Gottshall, president, Atlas Powder Co.; M. L. McCormack, manager, Rock Drill Department, Ingersoll-Rand Co.; R. R. Morgan, vice-president, LeRoi Co.; C. B. Peck, manager of sales, Anaconda Wire & Cable Co.; Albert E. Seep, president, the Mine & Smelter Supply Co.; Horace U. Siegel, president, Western Rock Bit Mfg. Co.; and W. L. Wearly, vice-president, Joy Manufacturing Co.

Special tribute was paid to the retiring members of the board, whose respective terms of service ranged from six to 28 years. Chairman Gottshall spoke of the fine service these men had rendered and expressed, in behalf of the Division, sincere thanks and appreciation for their loyal and effective work over the years.

O. T. Madsen of the Business and Defense Service Administration, Department of Commerce. discussed industrial mobilization and post-attack production measures. Madsen quoted President Eisenhower as saying, "A government can sincerely strive for peace, as ours is striving, and ask its people to make sacrifices for the sake of peace, but no government can place peace in the hearts of foreign rulers. So it is our duty to ourselves and to freedom itself to remain strong in all those ways—spiritual, economic, military—that will give us maximum safety against the possibility of aggressive action by others."

As a step toward preparation for continuity of production in case of attack, Madsen urged that each company establish a personnel succession list; and alternate headquarters. where immediately after a plant disaster all survivors should assemble; arrange matters on a legal basis to permit proper continuity of production in the event the entire board of directors should be wiped out, and set up an emergency accounting and auditing system with duplicate records placed in a safe place sufficiently removed from any obviously vunerable location.

He also urged that plans be prepared for immediate action to repair damages and to place each plant back in production. Alternate plant sites, he said, should be determined and plans laid for immediate transfer of production facilities should it become necessary. Among other necessary plans, he stressed that: alternate sources of raw material supplies should be planned; plans should be made to disperse reserve stocks of raw materials; much thought should be given to advance engineering and construction planning, as well as equipment planning; warehousing and storage of finished products should be well planned and dispersed if possible; adequate measures for the protection of production records, including trade secrets should be made. Transportation facilities should be planned for so that, as quickly as possible after an attack, personnel can be reassembled and reorganized into a going production unit. He urged that these measures be taken immediately and that everything possible be done to avoid confusion and duplication of effort.

At the Board of Governors meeting which immediately followed the meeting of the Manufacturers Division, the following officers were elected to take office in 1955: Chairman, J. W. Overstreet, National Electric Coil Co.; first vice chairman, Guy V. Woody, Allis-Chalmers Manufacturing Co.; second vice chairman, J. E. M. Wilson, Jeffrey Manufacturing Co.; third vice chairman, Jack How, Western Machinery Co.



Manufacturers Division met on Monday afternoon

Coal Show in Cleveland

The 1954 American Mining Congress Coal Convention at Cincinnati is now a matter of history. Everyone is looking forward to the giant Coal Show to be held in the Cleveland Public Auditorium in the spring of 1955. In the meantime mining men from all over the country, as well as those from metal and nonmetallic mining industries who were present at the meeting, will be applying the lessons they learned in Cincinnati, and while thinking back to the times they had there, will be anticipating an even bigger and better meeting next year.

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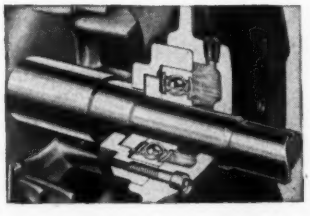
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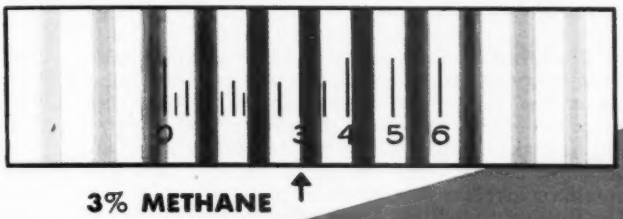
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Write for your copy of the Riken Methane Indicator bulle

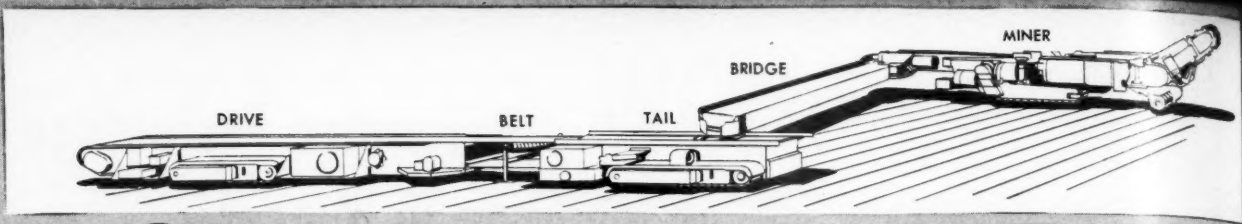
7 *Plants to Serve You*

National Mine Service Company

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JOY E-X-T-E-N-S-I-B-L-E BELT

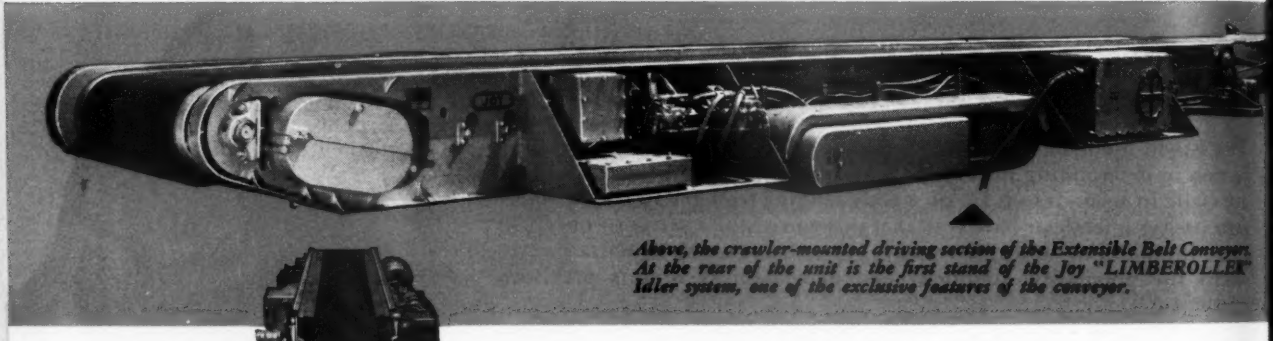
EXTENDS OR RETRACTS UNDER FULL LOAD FOR CONTINUOUS HAULAGE FROM CONTINUOUS MINING MACHINES

Operating Highlights

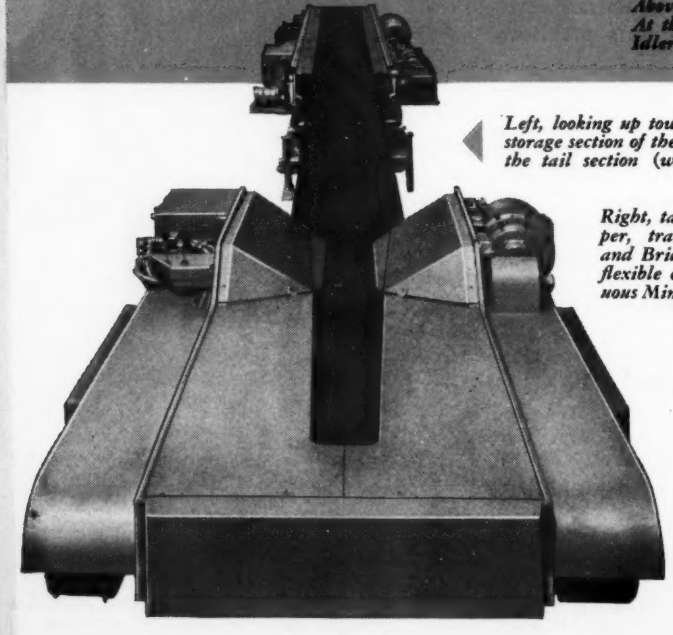
With the Joy "Ex-Belt" Conveyor, once again we have broken into new ground in our continuing development of the science of mechanized mining. Once again a Joy field-proved unit gives you a real opportunity to make another important reduction in your production cost-per-ton . . . the saving you need to maintain or increase your profit margin today.

The Extensible Belt Conveyor now, *for the first time,* gives you a continuous haulage system for Continuous Miners in driving rooms and entries up as far as 1,000 feet, including breakthroughs and taking pillar on retreat. Available in 24″, 30″ or 36″ widths, it consists of two main units: a driving section and a tail section, both of which are self-propelled on identical crawler treads. It extends or retracts 50 feet while operating under full load, and belt tension and slippage are under automatic control at all times. A 100-foot length of belt can be added or removed, as needed, in an average time of only 5.3 minutes; and the entire system can be moved over and set up for a new heading in less than 2 hours.

Perhaps most important of all, the Extensible Belt Conveyor follows the Joy tradition of simply-designed, rugged, foolproof equipment that can take the heaviest duty underground and stay on the job month in and month out. That is your final assurance of securing the favorable cost basis and production rates for which the Joy "Ex-Belt" was developed.

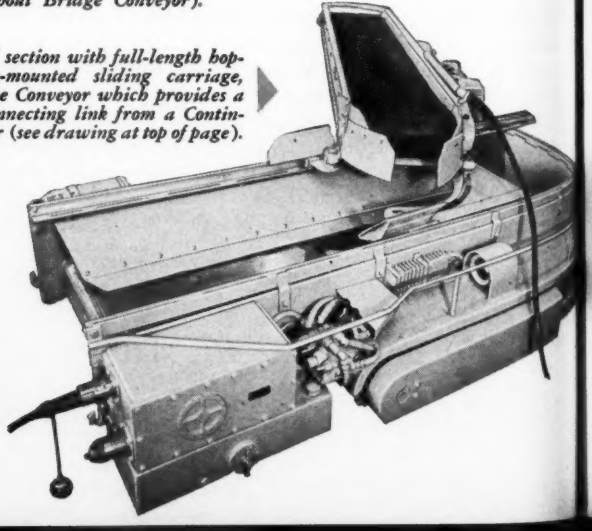


Above, the crawler-mounted driving section of the Extensible Belt Conveyor. At the rear of the unit is the first stand of the Joy "LIMBEROLLER" Idler system, one of the exclusive features of the conveyor.



Left, looking up toward the driving and belt storage section of the "Ex-Belt" Conveyor from the tail section (without Bridge Conveyor).

Right, tail section with full-length hopper, track-mounted sliding carriage, and Bridge Conveyor which provides a flexible connecting link from a Continuous Miner (see drawing at top of page).



JOY PIONEERED CONTINUOUS MINING

Now we pioneer

CONTINUOUS HAULAGE

Advantages

FAST, CONTINUOUS HAULAGE IN LOW OR HIGH COAL

The Joy Extensible Belt Conveyor is available in 24", 30" and 36" belt widths, for peak capacities ranging from 180 to 440 TPH in driving rooms or entries to depths of as much as 1,000 feet.

All models are of permissible construction throughout, and are only 26" in overall height.

SIMPLY DESIGNED FOR MAXIMUM DEPENDABILITY

Only three motors are employed in the "Ex-Belt" Conveyor (another in the Bridge Conveyor when it is added to the system). This simplicity of design reduces outages for motor service and repairs; cuts down maintenance costs; combines with other construction features to give you foolproof continuous haulage.

INCREASED MINING MACHINE CAPACITY

Use of the Joy "Ex-Belt" for continuous haulage definitely means less Miner downtime; better use of its productive capacity; greater return on the Miner investment and more tonnage per shift.

COMPLETE FLEXIBILITY

A rugged, one-piece Bridge Conveyor serves as a flexible connecting link between the "Ex-Belt" and the Continuous Miner. Combined with the articulating rear conveyor of the Miner, it permits wide freedom of movement and enables the operator to mine breakthroughs and extract pillars while advancing or retreating without interrupting the continuous flow of coal.

MINIMUM DELAY TIME

The Joy "Ex-Belt" extends or retracts for 50 feet while operating under full load. Idler stands are added or withdrawn while the belt is in full operation.

The 100-foot length of belting for the next 50 feet of movement can be added (or removed) in as little as 3 minutes and usually less than 8 minutes (5.3 minutes average in field time studies). A power drive does the work, making handling fast and effortless; and the extra belt is always added or removed at the room neck, meaning that minimum handling of the belt lengths is required.

MINIMUM HEADING TRANSFER TIME

With the power-propelled head and tail sections of the Extensible Belt eliminating "dead work," this entire continuous haulage system can be dismantled and set up for a new heading in 2 hours or less (note the 1¾-hour time study below).

FIELD-DEVELOPED ENGINEERING DETAILS

The head has a tandem drive with vulcanized, herringbone lagged pulleys, and an automatically-tensioned, multiple-loop takeup which holds 100 feet of belt. It pays out belt on advance; takes it up on retreat.

The tail section of the Conveyor extends the belt. An automatic signal device warns when the length in storage is coming to the end. The tail has a permissible power takeoff for a traveling bridge conveyor, and is available either with a hopper and track to carry a bridge conveyor, or with an adjustable hopper only, for use when taking coal from shuttle cars or portable conveyors.

Both head and tail sections are self-propelled, mounted on hydraulically-powered crawlers for easy mobility. The crawler units are identical, and all parts are interchangeable. Each is self-contained, with its own hydraulic system.

These are just a few of the cost-saving advantages built into the Joy Extensible Belt Conveyor. ● Let us help you to work out a haulage system that can help *your* profit picture. ***Joy Manufacturing Company, Oliver Bldg., Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario*

TYPICAL EXAMPLE of using the Joy Miner—Extensible Belt—Bridge Conveyor combination

Operation:	Driving room 5′ high, 16′ wide on 25′ centers to a depth of 600′.
Move Complete Setup to Next Room:	1¾ hours; actual time from stop of coal flow in one room until coal once again moving in a continuous stream in next room. Complete setup ready in time required to move Miner alone.
Outages due to Haulage:	Approximately 60 minutes total for adding belt lengths to Conveyor.

W&D CL 5234

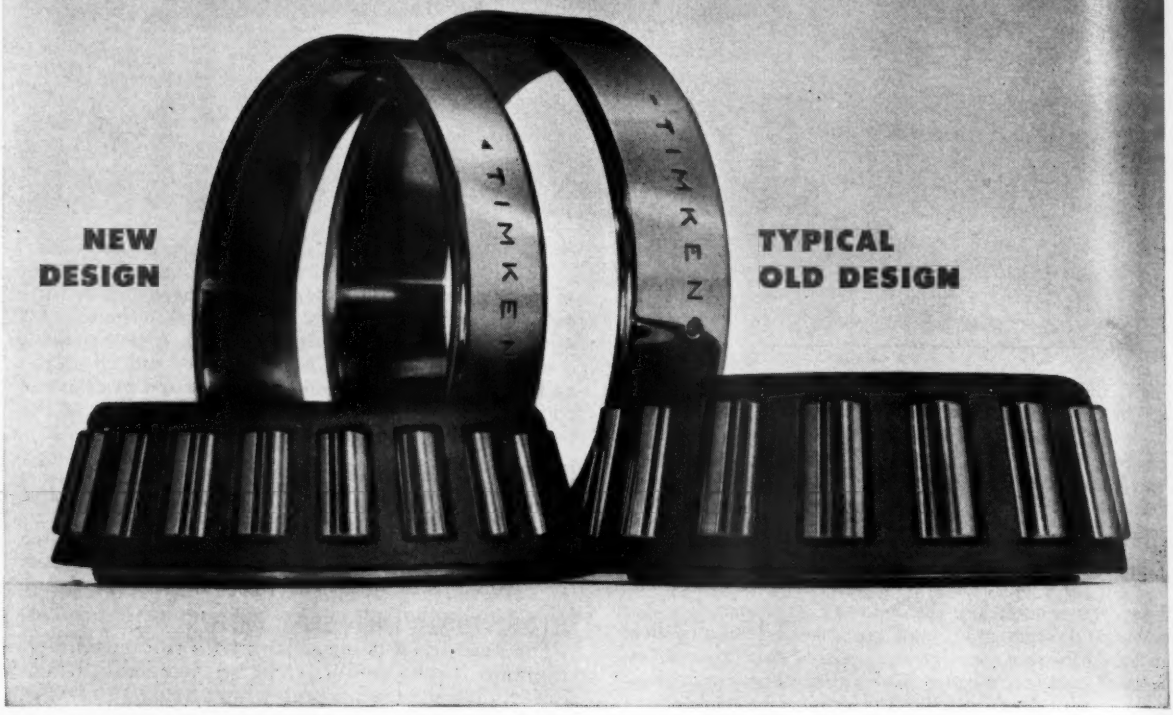
Consult a Joy Engineer



JOY

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The Timken Company pioneers again:



New TIMKEN® conveyor idler bearings save money, space, weight

THE Timken Company announces two new tapered roller bearings that cost substantially less than the Timken® bearings now used in heavy-duty conveyor idlers. They are considerably smaller in width and outside diameter, weigh 25% less. Yet they have ample load-carrying capacity.

This is the latest achievement of Timken Company research and engineering, which have pioneered many important advances in steel, surface finish and design of tapered roller bearings.

With the new Timken bearings you'll get all the proven advantages of Timken conveyor idler bearings, but at lower cost than ever.

Timken bearings' true rolling motion and extremely smooth surface finish practically eliminate friction. There's less sliding between idlers and belt.

Full line contact between rollers and races gives Timken bearings the high load capacity you need in heavy duty conveyor applications. And Timken bearings aren't just lubricated for "life", but lubricated yearly, or as conditions require, to insure *long* life. Fresh lubricant ends any chance of gummy, sticky, jammed bearings.

If you haven't seen the new Timken bearings yet, call your Timken Company representative or write: The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS


Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ↓ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←

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"This cable saves us money . . . there are far fewer breaks . . . and far fewer shorts from ground wires."



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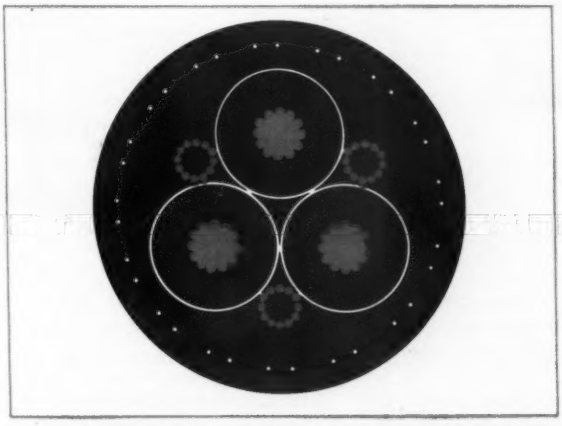
MINE FOREMAN:
"Securityflex sure is flexible . . . mighty easy to handle, too . . . the toughest cable we've ever used."



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MARION 4161

"Smooth — fast — lots of life." These are comments of operators on a fleet of seven MARION 4161 shovels in an eastern mine.

They could add "dependable—powerful—and economical" too, for the 4161 is famous for these qualities in the world's hardest digging.

The strength designed and built into the 4161 is matched by its Ward-Leonard Electric power. With Amplidyne or Rototrol controls, it has small-machine speed with big-machine output. Protection against overload is automatic.

You can pay more, you can pay less, but you can't buy more machine value anywhere if you need production, dependability and low-cost operation in hard digging. Ask for Bulletin 394.

MARION

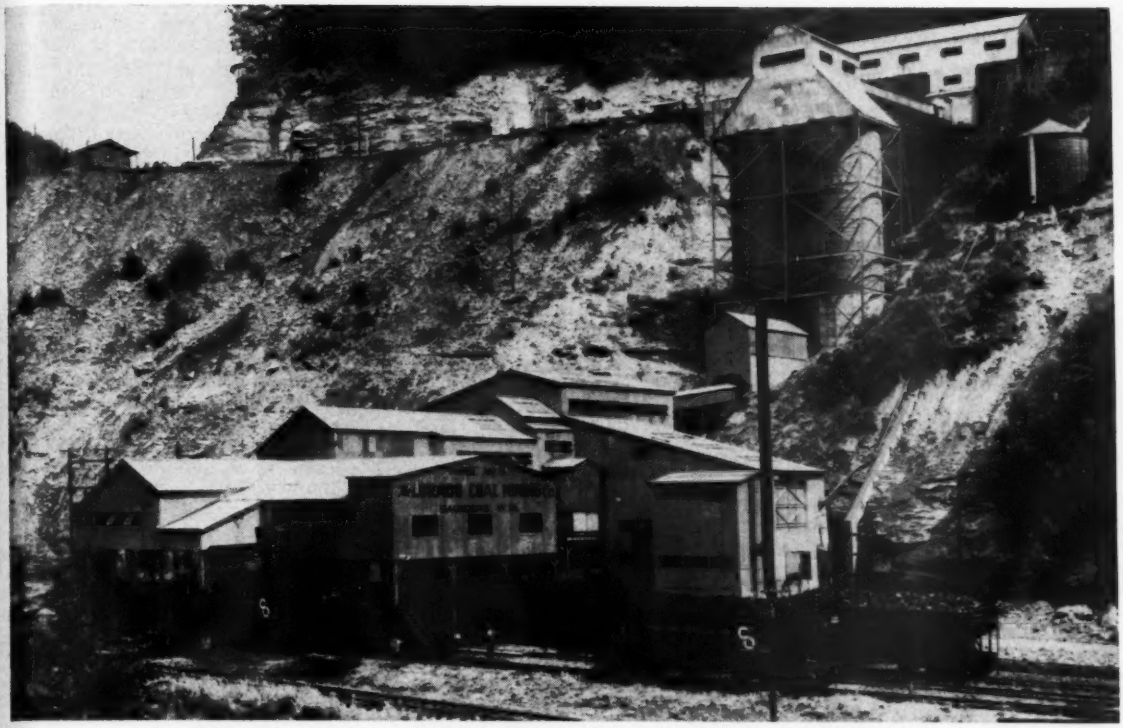
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MARION, OHIO, U. S. A.

MARION 70 YEARS OF PROGRESS

from ¾ cu. yd. to 45 cu. yds.

OFFICES AND WAREHOUSES IN ALL PRINCIPAL CITIES



Preparation plant, silos and rotary dump at the No. 5 mine of the Lorado Coal Mining Co.

Apply Manufacturing Techniques To Mining

Production Control, Material Control, Quality Control, Preventive Maintenance, Employe Training, Standard Practices—All These Have Helped Cut Costs 25 Percent and Raise Production for Lorado Coal Mining Co.

By T. M. BARRY
Partner
Barry and Co.

THE Industrial Engineering profession has often been described as one whose main role is that of continually looking for better ways to do jobs. It was perhaps this same outlook which led the management and operating heads of the Lorado Coal Mining Co. of Columbus, Ohio and Lorado, W. Va., to develop a management program which is rather unusual for their field of industry.

They felt there was room for improvement in their operating picture, and deliberately set out to see what could be done. The results of their efforts are very gratifying. They have reduced the direct cost of mining coal by about 25 percent, have increased their face tons per man-day (without elaborate equipment changes) by 40 percent and still see room for improvement.

Lorado had been operating on the basis of comparing their own methods, equipment and performance with those of other coal mining companies. This is still their practice. They discovered, however, that by looking beyond their own industry to the field of manufacturing there were a number of tried and proven solutions to problems which had been plaguing them for years.

It was no easy trick to adapt these new ideas to coal mining and get them working. It has taken over two years to do what has been done so far. Many of the reductions in cost came quite quickly—others were slower.

Learn New Concepts

In effect, Lorado management developed an *integrated* cost control program. This usually implies that a company has a functional operating organization, a cost accounting system tailored to centers of cost control which the organization chart sets up, detailed standards of performance for labor and supply costs and often incentives for reaching and staying at these standards. Closely tied to these basic steps are controls which help make a manufacturing business automatic; production control, material control, quality control, preventive maintenance, employe training, the use of standard practices, etc. Many mining operators use some of these steps, but Lorado decided to use them all and to have them devised in such a way as to support and strengthen each other. In doing so they found that:

(1) The same approach to controlling the maintenance of factory machinery works better for their mining machinery than any they had previously seen or tried.

(2) What industry calls "Produc-

COST CENTER #2 Tipple Foreman

CODE A-3 WEEK 2-13 to 2-19-54 COST CONTROL REPORT

	WEEKLY	DAILY	IDLE DAY	BUDGET	ACTUAL	VARIANCE	ACCRUED VARIANCE
LABOR		337.17		1,510.04	1,392.21	∮ 117.83	- 72.95
SUPERVISION							
SUPPLIES		114.12		476.87	589.50	- 112.63	∮ 86.62
POWER							
TOTAL		451.29		1,986.91	1,981.71	∮ 5.20	∮ 13.67

TONNAGE BUDGETED 5308 TONNAGE ACTUAL 5545 VARIANCE ∮ 237 COST PER TON .3574

AUTHORIZATION NUMBER	MATERIAL AUTHORIZED	MATERIAL ACTUAL	VARIANCE	LABOR AUTHORIZED	LABOR ACTUAL	VARIANCE
#27	150.00	150.00	-	-	-	-

1 Hour overtime allowed for each 285 tons over 1925 per day.

Records show at a glance how well each area of operation is sticking to budgeted costs

tion Control" meant just that for coal mining. As a result they have greatly reduced delays for empties, have surprisingly accurate tonnage forecasts and have better railroad car ordering control.

(3) A *direct costing* system found almost exclusively in manufacturing was just what the doctor ordered for them. It improved the usefulness of their accounting, which then became a critical tool for the operating men.

(4) Functional organization helped make everything else work better.

(5) The adoption and enforcement of standard ways of doing all repetitive jobs (so necessary in incentive shops in manufacturing) helped get everyone doing his job the best known way.

(6) In setting these standards they uncovered a lot of unbalance in crew or group work.

(7) Supervisors are just human enough to be able to get better production from their crews if they are led to do it by accurate standards of performance and fair incentive bonuses.

(8) By tying *quality* to the incentives, the men who can control coal quality were inspired to do just that.

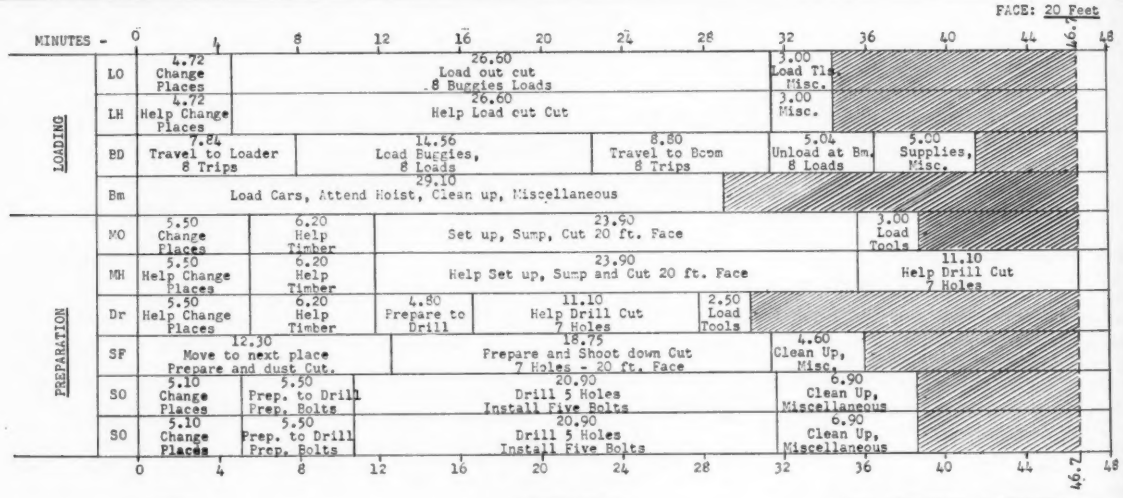
(9) They found, finally, that supervisors and men alike enjoyed their work more than they had before. Responsibilities were clearly defined and good work was recognized and rewarded.

Adopting the program required a lot of hard work and a number of steps.

Each Section on Budget

First step was to develop an organization structure which could be geared to controlling cost. The Lorado organization does not gain what distinction it might have among coal companies by the originality or uniqueness of its chart, but by the surprising degree of clarity of responsibilities actually found among its key people. Authority is delegated clearly and completely to correspond with responsibility, and each item of expense is the distinct responsibility of one man. There are no known instances of overlapping authority, or of people being given responsibility but not enough authority; or vice versa.

They had previously used a "horizontal" chart of accounts. Each supply item was charged to an account which generally defined the type of part or supply (such as Mobile Loader Parts, Rock Dust, Roof Bolts,



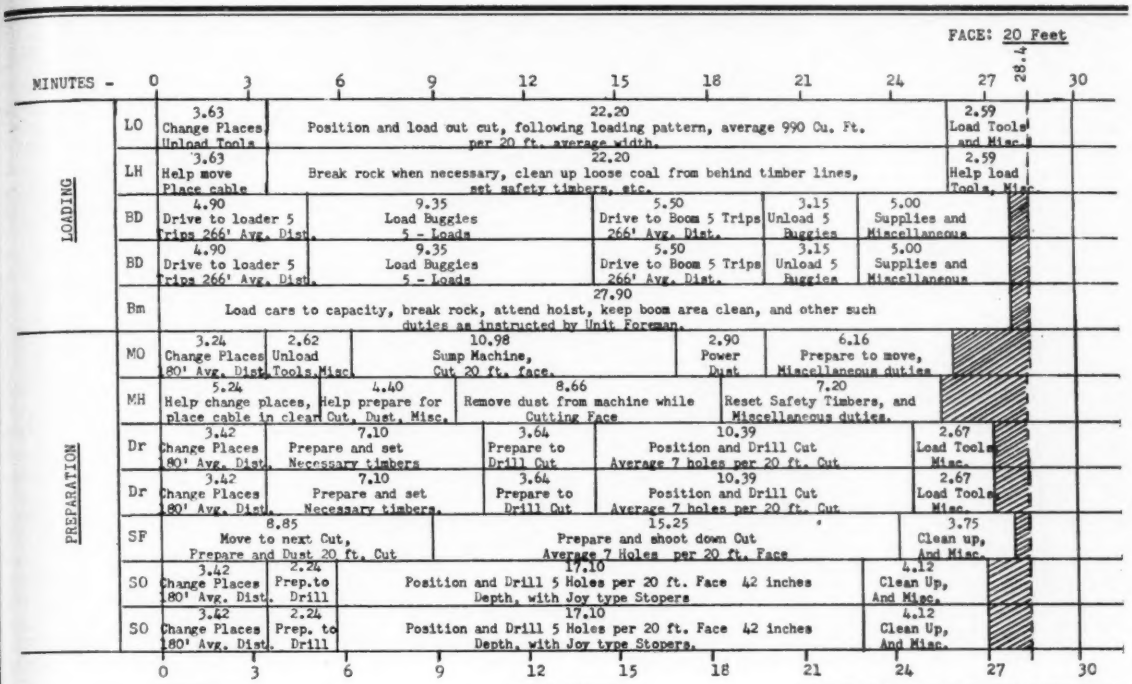
CREW
LO—Loader Operator
LH—Loader Helper
BD—Buggy Driver
Bm—Boom
MO—Machine Operator
MH—Machine Helper
DR—Driller
SF—Shot Firer
SO—Stoper Operator
SO—Stoper Operator

EQUIPMENT
1—14 BU Joy Loader
1—42E Buggy
1—212A Cutting Machine (7.5 ft cutter bar)
1—A7 Electric Hand Drill
2—Joy Type Stopers On Joy T-2 Truck
1—Loading Boom

100 PERCENT—POTENTIAL

Cuts	Tons
9.3	224

The above graphical representation of a timestudy shows an unbalanced crew. Cross-hatched areas represent the time lost per cut for each man in the crew



CREW

LO—Loader Operator
LH—Loader Helper
BD—Buggy Driver
BD—Buggy Driver
Bm—Boom
MO—Cutting Machine Operator
MH—Cutting Machine Helper
Dr—Driller
Dr—Driller
SF—Shot Firer
SO—Stoper Operator
SO—Stoper Operator

EQUIPMENT

1—14 BU Joy Loader
2—42E Buggies
1—29U Cutting Machine (9.5 ft cutter bar)
1—Hydraulic Drill On Joy T-2 Truck
2—Joy Type Stopers On Joy T-2 Truck
1—Loading Boom

100 PERCENT EFFICIENCY POTENTIAL

Cuts	Tons
15.3	475

By adding two men and one shuttle car, changing to a different type cutting machine and coal drill, production potential was increased 251 tons per shift

etc.), but did not charge it to the person responsible for its control. This was also true in some instances for labor. The weakness of this system was in the lack of control information. Management knew how much had been spent for roof bolts, for example, but did not know which unit foreman had spent too much. In other words, they knew which groups of expenses were high, but did not always know exactly who had made them high.

The solution to this problem lay in a direct costing system—sometimes described as giving "vertical" control. It collects costs by control center; with less regard to the type of part, etc. At Lorado it has made it possible to set engineered standards for nearly all labor and supply expenses, and to compare these standards with actual expenses on a weekly basis. Every dollar spent at Lorado is based on a budgeted standard. Each week new budgets are issued, based on standard tonnage and authorized special work. Any variances from standard are shown on the cost summaries issued to each key man.

The effect of this system is that each key man is in business for himself. All expenses of mining appear as the items some one individual must control. The company itself is sort of a holding company for fifteen or twenty small businesses. Each man is given a budgeted amount of dollars for labor and supplies, and his cost performance (and other factors) is the basis for his incentive bonus reward.

Work Program Balanced

With this foundation the point was reached where more controls were needed to determine how much should be allowed for labor and supplies at each cost center. Assurance was needed that each key man would be able to work without delays beyond his control. This required controlled flow of supplies, empty cars, etc. Consistently good equipment performance had to be assured.

In setting the labor standards, the timestudy and the *fair day's work* concept was used—a direct "lift" from manufacturing. It was discovered that the time it took one man to do a job was not necessarily the time to expect from all men. Weaknesses also showed up in averaging such times. The plan was adopted of setting all standards in terms of a fair day's work for a fair day's pay, and all standards were set by this method. Every timestudy has been "rated" or "leveled" to reflect the productivity observed. An effort is made to make all standards comply with the basic requirements of fair day's work standards, i. e., that they represent the amount of work a normal, trained operator or worker can perform in a normal (eight hours or less) shift applying himself conscientiously and not inducing undue fatigue.

Time studies uncovered some great areas for cost reduction. In arriving at the standards it was found that there were often gaps in work content for men on the same crew. Committees were set up to analyze and



Lorado Management Committee. Seated, (left to right) B. A. Workman, Supt. of mines, and L. F. Workman, gen. mgr. of mines. Standing, A. T. Patterson, asst. to gen. mgr. of mines; F. B. Amburgey, cashier; T. L. Johnson, asst. supt. of mines and M. L. Milam, chief engr.

rectify these gaps and greatly *improved balance*. Shorter cycles have resulted from their studies.

These changes involved a number of different things. The width of faces controlled all face cycles, but to varying degrees. It was found that slight changes (less than two ft) in face width would help balance the work among crews. Haulage, the long cycle on another unit, was "unplugged" as a bottleneck with the addition of short sideboards to the shuttlecars. The change in per-trip coal capacity was small, but balanced out the cycle at three minutes less time and gave an extra cut of coal each shift. Another control over balance was the length of cutter bars. Longer bars helped some units more than others, and these were placed where the engineering study showed they would be most valuable. Another solution to unbalance was the re-assignment of work from one face crew (or man) to another on the same mining unit. In all, over 65 such changes were incorporated in one mine alone without the addition of any higher capacity equipment.

Establish Standard Practices

In setting standards it was found that there were many ways of doing each job. The standards were set for the best way, and an extensive training program conducted in the use of the best known methods. These became Lorado Standard Practices.

Production control techniques were borrowed to set up a controlled system of reporting and scheduling haulage and dumping, supply deliveries, etc. There are any number of systems which might have worked. Lorado Standards are still being improved, but avoidable delays have already been reduced to a very low level.

Big strides have been made in getting maintenance closely controlled. Machinery is serviced nightly according to a "daily maintenance" chart. It gets weekly servicing on other control points, monthly on still others and is rotated through overhaul at scheduled intervals. The secret of success has been in enforcing and thoroughly policing this preventive maintenance work. All servicing must be checked off and signed for. Any delays resulting from faulty servicing means prompt disciplinary action.

While the results of this program have been gratifying, the Lorado people feel that the secret for continuing success lies in recognizing that mining is different from manufacturing, and that these controls must be handled more deftly. Mining is not as "automatic" as the work of a furniture plant. Closer attention must be paid to "variables" and the many unpredictable occurrences which so often pop up in mining.

Committee Study the Key

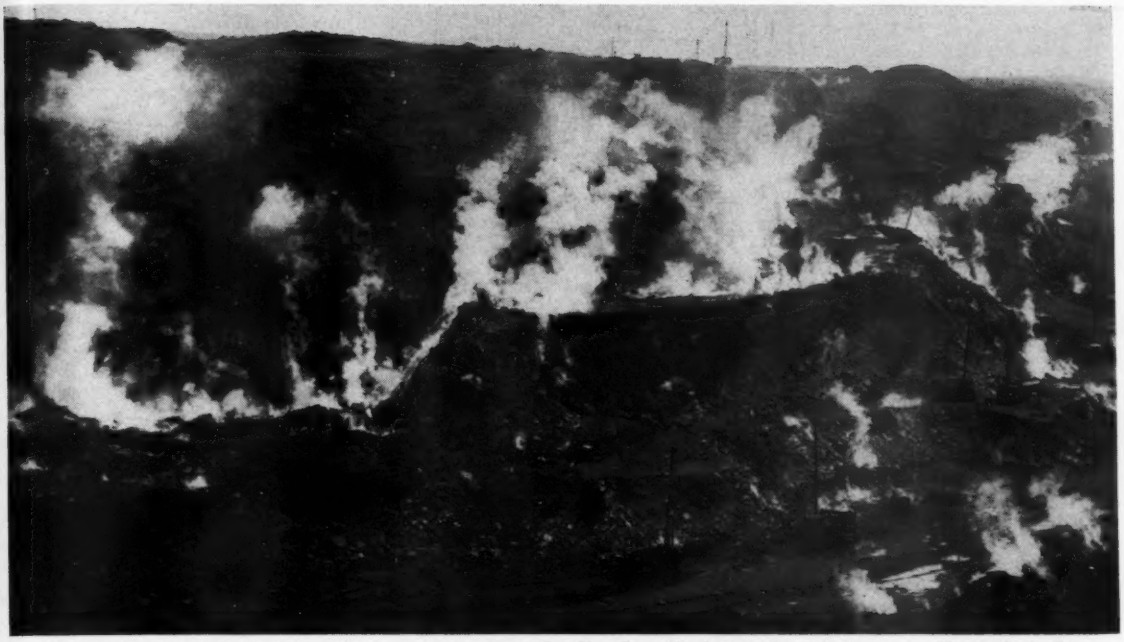
The most positive solution to most of these problems has been the widespread use of committee study. Each key man, from the general manager down to, but not including, the lowest level of supervision, has weekly meetings with his own immediate subordinates. The agenda for these meetings includes the analysis of the past week's performance and problems; decisions of what to do about them; forecasts of the next week's performances and problems, and any longer range planning that might be in order. The meetings are fairly brief, positive and businesslike.

As is common in manufacturing, the stabilizing force throughout is an industrial engineering department. This department is charged with the job of setting time and cost standards, helping develop new methods and systems, policing Standard Practices, making special cost studies and estimating costs not covered by standards.

Lorado is justly proud of the progress made so far. There are many more roads to improvement, though, and management feels a good long look down each one will produce even better results in the future.



Standard practices upped production



Not a scene from Dante's Inferno, but a working area at the Shen-Penn Production Co. strippings near Shenandoah, Pa.

Anthracite Stripping In Burning Areas

Incandescent Rock, Burning Coal and Drill Hole Temperatures Above 1500°F Overcome to Recover 925,000 Tons of Anthracite

By JOHN W. DAVIES
Blasting Engineer
Shen-Penn Production Co.

IN the Anthracite Region of Pennsylvania stripping conditions are normally somewhat rugged. When these conditions are further aggravated by active mine fires, difficult problems are multiplied manifold.

Such were the prospects at the Shenandoah Stripping operated by the Shen-Penn Production Co. for its parent company, The Philadelphia and Reading Coal and Iron Co. The major portion of this mine is located within the limits of the Borough of Shenandoah in Schuykill County, immediately adjacent to the built-up section. The area being stripped is approximately 9000 ft long, 3000 ft wide and averages about 300 ft deep. From it 66,564,000 cu yd of overburden will be removed to permit the recovery of 10,347,000 gross rough cleaned tons of anthracite from the Mammoth Vein and several other smaller veins. Of these quantities, a total of 44,023,000 cu yd of overburden and 4,742,000 gross rough cleaned tons of coal were removed to February 1, 1954. The coal is delivered by truck to a cleaner plant and thence by conveyor belt to St. Nicholas Central Breaker for final preparation.

All of the tract had been previously worked underground but when the last of a series of mine fires broke out in 1932 in the Shenandoah City Colliery, attempts to control or extinguish the fire failed and operation of the mine was discontinued.

Procedure and Equipment

As the years went by, stripping techniques made great advances and gradually the immense anthracite reserves in the area came in for close scrutiny as potential stripping. However, in the meantime, the underground fire advanced steadily. In fact, by the time stripping operations were inaugurated in 1946, it had spread vertically to the surface and horizontally in all directions until it was becoming a serious threat to the lives and property of the people of Shenandoah, a town of about 15,000. The surface over a large area was denuded of all vegetation and was so hot that sticks placed in cracks in the ground would quickly burst into flames.

In 1946 the Shen-Penn Production Co. was organized to operate stripping for the parent company. The first project assigned was the Shenandoah Stripping. Natural conditions in the area indicated the use of straight shovel front loading equipment with rear dump trucks for haulage. Following is a list of the major equipment on the job:

2	Bucyrus 6-cu yd Shovels
2	P. & H. 6-cu yd Shovels
2	Bucyrus 5-cu yd Shovels
1	P. & H. 4-cu yd Shovel
1	Bucyrus 1½-cu yd Dragline
65	22-ton Rear Dump Trucks
22	Bucyrus Churn Drills
6	Caterpillar Dozers
2	Road Graders

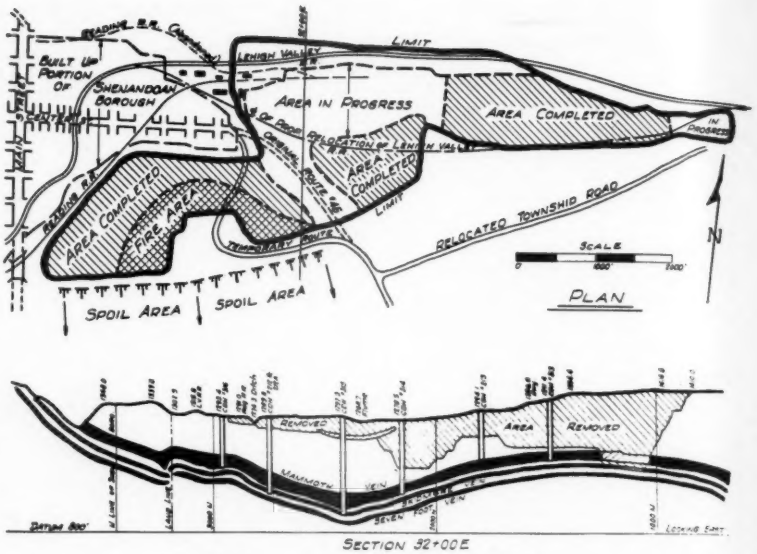
Operations were begun on a three shift basis in the eastern end of the project in August 1946 and in the

western or fire zone in August 1947. The burning area was about 2000 ft long by 800 ft wide and contained 6,000,000 cu yd and 925,000 gross tons of rough cleaned coal. The first work in the fire zone was along the northern and western edges near the rim of the town. No great difficulty was encountered as the overburden was drilled, shot and excavated in 25-ft benches. About the only unusual condition here was some dust due to the close proximity of the fire. However, as the work advanced toward the fire proper and temperatures mounted rapidly, a variety of peculiar conditions appeared.

Incandescent Overburden

A great deal of the ground was at incandescant temperatures (1500°F and over) and, as the shovels advanced into it, trailing cables had to be suspended and anthracit silt or clay spread in a layer over the bench behind the shovels for insulation to protect truck tires and the feet of workmen. At the working face while trucks were parked for loading the tires were kept under constant observation as they frequently broke into flame. For these occasions fire extinguishers were always instantly available. One very annoying condition was the dust which at every movement of the bucket during the loading cycle would burst forth in great billows and completely obscure the surroundings. The shovels always dug with the wind blowing toward the face or away from the operator and usually one side loading was necessary for the comfort of the operator. Cabs were equipped with blowers to force clear air through the shovel from the back and through the front.

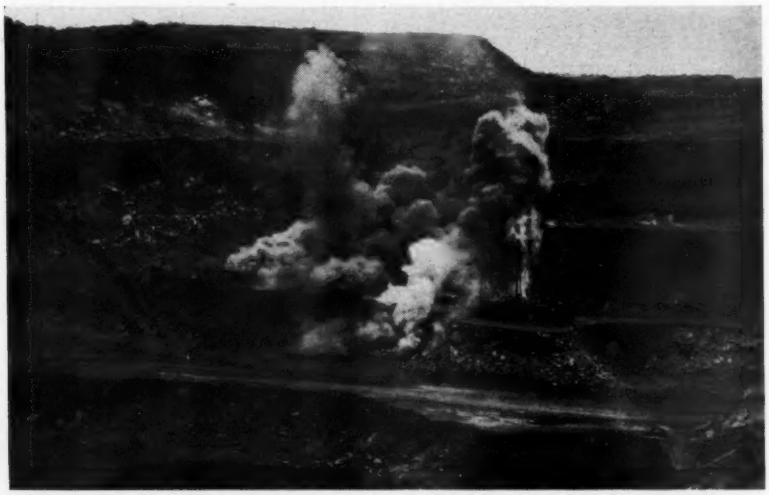
Excavated overburden was hauled to the spoil areas and placed in individual piles. The material was allowed to cool and then levelled off so



Mining area at the Shenandoah Stripping

that each layer was only a few feet thick. Under this procedure the hot material was usually handled very successfully but in a few instances there were stubborn fires in the dumps. These were extinguished through the use of bulldozers, sometimes augmented by a small dragline, to turn the materials over while large quantities of water were applied. The dumps were operated with an eye on the prevailing winds to prevent dust clouds from passing over the inhabited areas.

Coal removal also presented some problems along with a sight that always seemed a paradox to visitors. This was the fact that no incandescence was ever observed in solid coal which is very dense and does not contain sufficient oxygen for combustion. It was observed that the fire was propagated through loose coal in the gobs of the old underground workings as well as through the rock strata. Excavation of coal was carried out in much the same manner as was the rock. The dry hot coal could not be sent directly to the cleaner plant and consequently was sent to a stockpile. A continual water spray was used to treat the stockpile both during and after dumping, using two 2½-in. fire hoses. After cooling in the stockpile, the coal was reloaded and shipped to the plant for rough cleaning. When hot coal was loaded out of a solid vein and dumped on a pile with insufficient water treatment, it would become a roaring inferno in a few hours.



Shots were fired only when the wind was right to carry fumes away from nearby Shenandoah

Drilling Problems

Of course, even in hot ground, loading methods were more or less conventional except as to dust and heat precautions. However, drilling and blasting was much more critical and offered some new problems in operating technique. To blast the 25-ft benches, nine-in. churn drills were used, drilling 30-ft holes. In drilling these hot holes, the first three or four ft were drilled dry. Use of water was then begun, great care being exercised to avoid scalding the crew by the geyser effect which occurred when the water came into contact with the heated rock. In a solid hole, from this point on, normal churn drilling procedures prevailed since the water had the effect of cooling a very thin annular space around the hole. Water consumed in drilling was about double that required for a similar hole in cool ground. Because of the underground mining, many of the holes were in broken strata. When the bottom of these holes advanced from solid into broken ground, the drilling mud

would drop suddenly into very hot crevices carrying strong updrafts which tended to violently erupt hot water and steam from the mouth of the hole.

These holes vented hot air and gases which were rather efficiently taken care of by the installation of an electric blower on the drill platform; this directed a large volume of air across the top of the hole, adding greatly to the comfort and well-being of the men who were also equipped with safety glasses to avoid eye injury from hot water, steam and hot mud. A constant check on the nature of the underground atmosphere was made by laboratory chemical analyses of air samples from the bore holes and with carbon monoxide detectors. Particular care was taken to avoid having drills move or set up over previously drilled hot holes.

No adverse effects on the stems or bits were noticed in the hot drilling operations since the water used kept the steel at low temperatures. Drill footages per shift under these conditions were slightly less than were obtained in similar rock under cool conditions. The overburden consisted mostly of fine grained sandstone with smaller amounts of hard shale and conglomerate.

Hole spacings in solid ground were generally on 18 by 18-ft centers. As the benches approached the veins which had in most cases been previously mined from underground, it was often possible to determine the outlines of the pillars and thus place the holes to best advantage.

Special Explosive Developed

Prior to the time of this operation the only explosive made for hot hole use was the standard type in an asbestos wrapped package. This was definitely unsatisfactory and, since proposed operations in burning areas were on such a large scale, several of the major powder manufacturers began development work on an explosive which would be safe for use under the high temperatures. Finally a nitro-carbonitrate type blasting agent was developed. After exhaustive laboratory and field tests on this operation it was accepted as suitable for the conditions.

Laboratory tests indicated that it would not detonate under intense heat but would fume off in varying periods of time depending on temperatures. The time between placing the charge and fuming-off was determined for the various temperatures and tabulated. For practical use in the field the allowable loading time was set at one half the actual fume-off time at the temperature of the hottest hole in a shot. From the various laboratory and field tests it was determined that any hole showing a temperature of 150°F or higher should be regarded as a hot hole. More than half the holes were over 600°F and many ranged well above 1500°F. The tabulation above shows the maximum loading and firing time at various temperatures as recommended and practiced.

Temperature Limits Fahrenheit	*Maximum Time for Loading and Firing*
Below 150°	24 hours
150° - 250°	60 minutes
250° - 400°	30 "
400° - 500°	20 "
500° - 600°	10 "
600° - 700°	8 "
700° - 750°	6 "
750° - 800°	3 "

(Note: Temperatures above 800°F were water cooled before loading)

As temperatures increased it became apparent that the conventional primacord would not be satisfactory. An RDX plastic primacord designed to withstand higher temperatures was then developed and used throughout the hot blasting operations.

The number of holes included in any one blast was contingent on temperatures of holes and condition of the strata. Usually holes in broken strata showed much higher temperatures than nearby holes in solid strata. If a blast in a hot section included holes under 150°F, these holes were also loaded with nitro-carbonitrate blasting agent. This precaution was observed because after the stemming of a hot hole there was a possibility of hot gases being forced into the cooler holes. The average number of holes in these shots was six and ranged from two to 18.

After a shot had been drilled and scheduled for loading, temperatures of all holes were measured and recorded. These observations were made just before loading and throughout the length of each drill hole since wide variations often occurred at different depths in the same hole.

Blasting Techniques

Before loading hot holes thorough advance preparations were made to insure a smooth and unhampered operation. Anthracite silt was used for stemming and a sufficient quantity was placed close to each hole. Just prior to loading, the charges were distributed to the various holes, keeping both primers and main charges at least six ft from the collar of the hole on cool material. The explosives truck was then immediately moved out of the blasting area.

Meanwhile a 2000-gal motorized water tank would be moved into position so that all hot holes could be readily reached with a two-in. hose. When the temperatures required reduction, a controlled stream of water was run into each hole. In the case of a solid hole sufficient water was added to half fill the hole. Holes drilled through crevices were more difficult to handle due to the escape of water. Some of them could be sealed off by washing materials into the cracks while those with larger openings had to be cooled by the use of larger volumes of water. Solid holes which had been standing long enough to allow drilling water to evaporate became cherry red from a few inches below the surface to the bottom. In watering broken holes the steam of water was directed down the center to avoid dislodging loose material and possibly closing the hole.



Blastholes had to be water cooled before and during loading operations

Solid holes were always watered first and watering was continued until temperatures were reduced to required levels.

Extreme caution was necessary in the initial application of water to the burning hole since this caused a jet of steam, hot water and small fragments of rock to shoot 25 or 30 ft into the air. To avoid injury to personnel, the hose was placed at the collar of the hole to be cooled and the flow of water controlled from a safe distance. The highest temperature observed in any hole after cooling determined the sequence of loading and governed the maximum time which should elapse between the actual beginning of loading and detonation of the shot. This allowable time varied from 24 hours for a hole with a temperature of 150°F before cooling to three minutes for shots containing holes of 800°F or more. Those latter holes were not loaded at all if they could not be cooled below 800°F. Few holes could not be so cooled.

collar. He maintained the lines in the center of the hole so that they were surrounded by stemming which was placed in the hole dry but water soaked in the hole. Dual lines were used as insurance in case one of the lines was burned off by coming into contact with the side of the hole.

As the stemming of each hole was completed, the stemmers would move to the next hole while the third technical man tied a primacord booster on the twin down lines. These boosters were developed for use with the special primacord which was not blasting cap sensitive.

Upon completion of loading of all holes in a shot the water tank and all men no longer required were removed from the blasting area. The technical service representatives then quickly laid out the primacord trunk lines on cool material, connecting them with the down lines. A sufficient length of firing cable with two electric blasting caps attached had been previously laid out, terminating at the



Particular care had to be taken to assure that the special primacord did not touch the side of the blast hole

After the above procedure was completed, active loading was begun. Crews used on high temperature loading generally consisted of seven men; three technical service representatives of the explosive manufacturer, three men to handle stemming and one water man.

Customary charge in each 30-ft hole was 300 lb. During loading, the water man kept a constant stream of water in the hole. One technical service man handled the actual loading, the primer always being the last unit to be lowered into the hole. The three-man stemming crew immediately began their part of the operation. Each primer had attached to it two down lines of special primacord previously cut to the required length. It was the duty of the second service man to manage the primacord until the hole had been stemmed to the firing station. This assembly was circuit tested and shunted until ready for use. When all was ready the men were conveyed by truck from the blasting area, leaving one man to complete the firing assembly, remove the shunt, connect the battery and detonate the blast.

Close supervision of the surrounding area was maintained during these operations so that when the technical man signalled he was ready, the blast could be detonated without delay. A very careful time check was kept from the beginning of loading to firing to keep within the manufacturer's recommended limits. With the above seven-man crew, holes could be loaded and fired in an average of two minutes per hole.

Immediately after the blast, the shot area was inspected for misfires which happen occasionally in all blasting operations. When this occurred in hot ground, the undetonated charge would fume off with a large volume of dense brown smoke; within a few minutes in the very hot holes and somewhat later with cooler ones. It is characteristic of this type of blasting material to fume off in this manner rather than detonate as ordinary explosive might. When misfires occurred all personnel was kept clear of the area until the fuming off period was completed. The heat to which this rock had been subjected rendered it quite brittle and thus produced excellent fragmentation.

Dust and Flying Rock

Upon detonation, a tremendous cloud of vari-colored dust and vapor would be discharged into the air so that it was necessary to carry on blasting operations with the wind blowing from nearby Shenandoah. Failure to consider this factor would have invited loud complaints from the people as the dust would have settled over the town.

Some of the area was very close to the built-up portion of Shenandoah so that at times it was necessary to take extra precautions against flying material. This was controlled by the use of nine-ft square blasting mats closely woven of ½ or ¾-in. wire rope and weighing about 1000 lb. These mats were placed over the holes with the aid of a churn drill sand line. Seismographic records were maintained to check blasting vibrations at nearby buildings in order to regulate the number of pounds per blast so as not to exceed the allowable vibration limits.

As previously mentioned, the removal of the burning material after blasting was a problem. The life of shovel dippers, truck bodies and tires were adversely affected to a great degree by the intense heat.

In damp or rainy weather dense fog would envelop the area with very low visability. For such periods, strings of electric lights spaced six ft apart were placed along the roads in the area to guide the movement of the equipment. Sometimes this was necessary even on the day shift.

The whole burning area, to one not concerned with the problems of removing it, presented a spectacular sight at night with the myriad blue tongues of flame against a glowing red background. From a distance the trucks leaving the pit carrying red hot loads of rock looked like giant fireflies.

All of the stripping in the fire area is now completed. No serious mishaps of any kind were experienced. The successful completion of this operation is a tribute to the resourcefulness of the men on the job and the research and cooperation of the explosives manufacturers.



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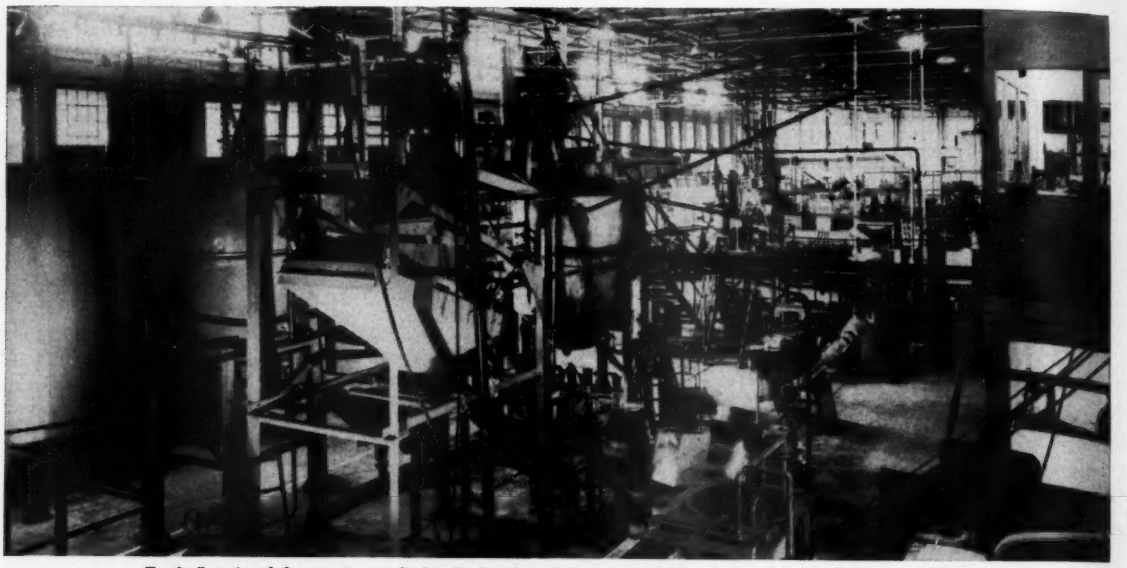
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Froth flotation laboratories at Stoke Orchard seek better methods of cleaning small sizes and fines

New Methods Of Coal Treatment

Progress Being Made in Utilization of Fines at Britain's Central Research Establishment

By E. ROSE

Until recently an official of Britain's National Coal Board



Dr. J. Bronowski is director of the Central Research Establishment of Britain's National Coal Board

THE research program of the National Coal Board's Central Research Establishment at Stoke Orchard in Gloucestershire, England, has three basic objectives: to make coal more efficient as a source of energy; to transform coal from the state in which it is mined into high quality fuels; and to assist in preventing waste and damage caused by smoke. The successful achievement of these aims would ease considerably Britain's coal supply problems.

The coal industry must develop better methods of cleaning small coal and "fines," as it is well aware. Mines in Britain, by producing more coal and using more machinery to mine it, are increasing the amounts of fine coal in run-of-mine product. Cleaning and drying this coal present difficult problems.

One of the methods used for cleaning fine coal is adapted from the metal mining industry. This is froth flotation, and when Stoke Orchard started work on the subject, it was obvious that the coal industry was about to expand greatly the use of the method, of which there are several variations.

Developed from the Callow Cell

The Central Research Establishment flotation cell—the mat cell—is essentially a development from the Callow pneumatic cell, which has been in use for a long time in the mineral dressing. In the original Callow cell, the porous medium through which the air is admitted is made of canvas or rubber perforated with fine holes. This medium is replaced in the Establishment's mat cell by a diaphragm built up from sintered metallic tiles of uniform porosity. By this means, efficient aeration is achieved with great economy in air consumption.

This cell is now undergoing its final trials at a number of washeries in order that a reliable appreciation of its performance and economies in comparison with that of other devices may be obtained. It has also been incorporated as the central unit in a mobile washery, designed to produce five tph of clean coal, and to be used at washeries, slurry ponds and dumps anywhere. There is enough coal in these ponds and dumps to make a worthwhile addition to coal supplies, if it can be recovered economically. It is significant that the raw fine coal thus treated contains 25 to 30 percent of ash and the clean product 10 to 15 percent. The tailings contain over 60 percent.

Dewatering Difficult

Dewatering the clean coal is often a difficult operation, involving the use of vacuum filters. The use of simpler equipment similar in operation to a household mangle, is now being investigated.

Not all attention, however, is directed to fine coal. The common "jig-

ging" process used in the cleaning of lump coal is reasonably efficient, but the fundamental principles on which the process works are not as yet perfectly understood. To get a clearer picture of what happens to individual particles at the instant of closure of the jig bed, high-speed photography is being employed. In another experiment, a bed of particles differing in density to correspond to coal and dirt is sampled continuously under varying conditions of jigging.

Partially Oxidize Fines

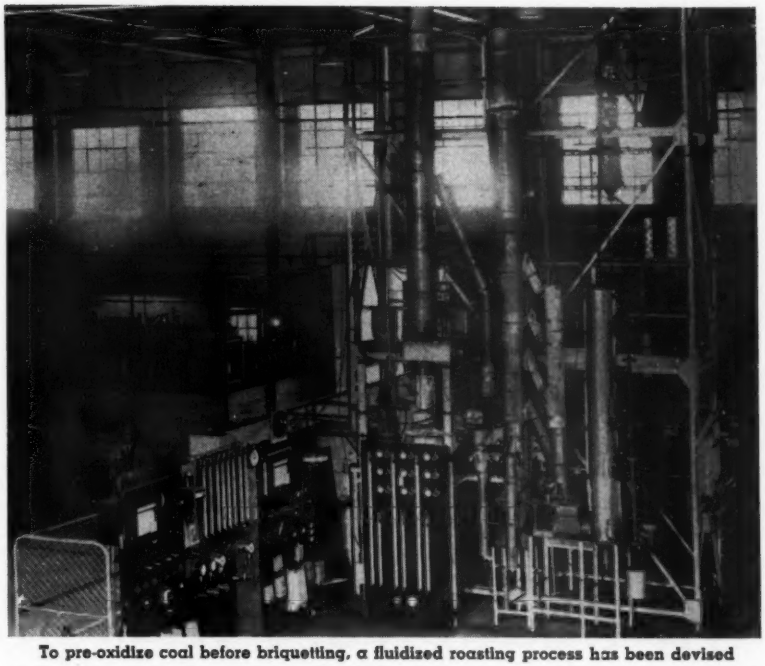
A most important field of research at Stoke Orchard concerns increasing the range of coals from which smokeless fuel can be made. The coals normally used for making "Phurnacite" briquettes, a well-known smokeless domestic fuel contain about 13 percent volatile matter. The coals that were first considered as possibilities when it was proposed to widen the scope of the process were the medium volatile coals (up to about 20 percent volatiles.) But these coals are also relatively scarce, and both these and others, more abundant, in the high volatile range, would need pre-treatment before briquetting to reduce their swelling and agglutinating properties.

This can be done by the addition of quite small amounts of oxygen to the coals. The first experiments were made in a rotary oxidizer, but later attention was focussed on the possibility of oxidizing the coal while it is in a fluidized state. A gas is blown through a bed of fine particles in such a way that they become separated from one another but stay in the reaction zone long enough to allow the desired degree of oxidation to take place. This technique is being employed in two pilot plants.

Double Pre-treatment

The process evolved at the Central Research Establishment for briquetting these medium and high volatile coals requires a double pre-treatment —first, pre-oxidation, and secondly, pre-carbonization to drive off the volatile matter before briquetting and so avoid cracking of the briquettes in the final carbonization stage. Other processes have been proposed in which this pre-carbonization is claimed to be unnecessary, and further investigation will, no doubt, be made by the National Coal Board to determine which method is most suitable for coals mined in Britain.

Arising from the needs of the "Phurnacite" plant, a meter has been developed at Stoke Orchard for the continuous measurement of moisture in fine coal. The operation of the instrument depends on the measure of the dielectric constant. To overcome the difficulty that wet coal has a high conductivity, the measurement of the dielectric constant is made at high frequency. The actual requirement at the plant is to measure moisture contents of the order of four percent but, with very little modification, the meter could be adapted to the measurement of moistures up to 15 percent in many coals, or even up to 25 percent in some.

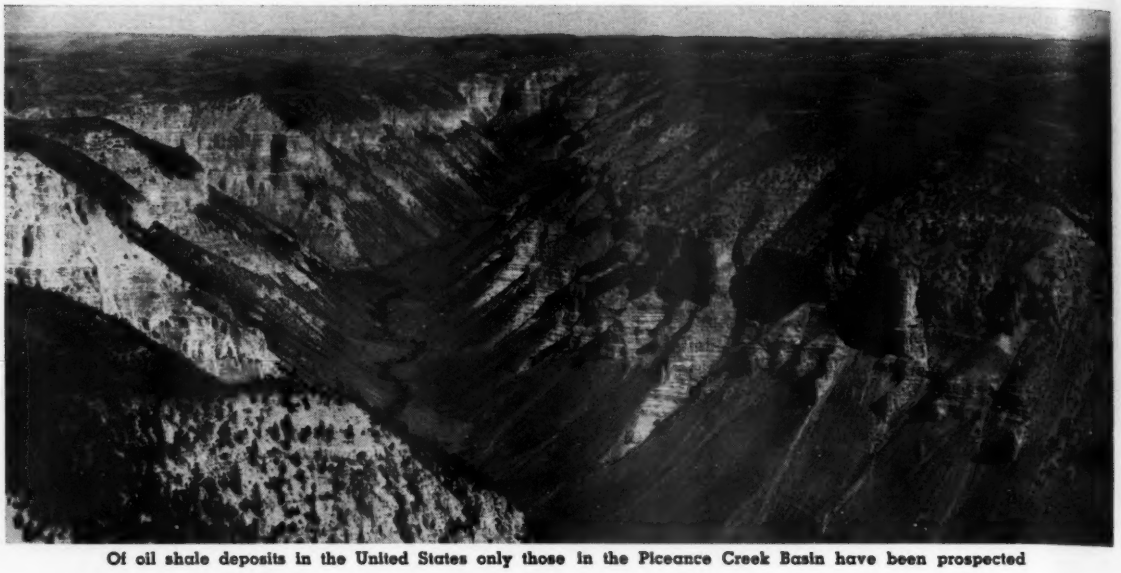


To pre-oxidize coal before briquetting, a fluidized roasting process has been devised

Another, though less important, piece of research, is concerned with mechanical sorting of "hards" and "brights," which are sometimes found together in the same seam and have to be mined together, although their most suitable disposal is to different markets. A device has been developed for separating them by using the reflection of light from the coal onto a photo-electric cell.



Basic research is being done to get a clearer picture of what happens in the jig bed



Of oil shale deposits in the United States only those in the Piceance Creek Basin have been prospected

Oil Shale Vast Reservoir Of Energy

Part I—Mining by Underground Room and Pillar Methods Yields 150 Tons per Man Day

By TELL ERTL

Chairman
Department of Mining and Petroleum Engineering
Ohio State University

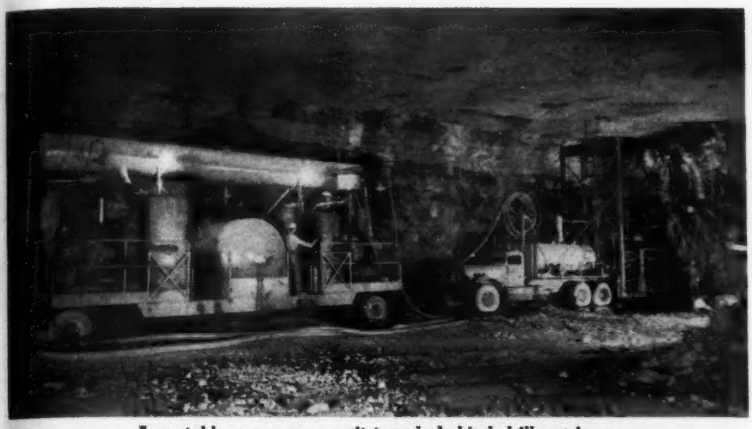
ACCORDING to the Paley report, 1,500,000 barrels a day of liquid fuel will be produced from oil shale in 20 years. Roughly two tons of 30-gallons-a-ton oil shale will have to be mined to yield one barrel of finished gasoline or diesel fuel. Therefore, approximately 3,000,000 tons of oil shale will be mined a day.

Oil shale is found in at least 27 states, and underlies one-tenth of the nation. The amount of liquid fuel recoverable from domestic oil shale resources is in the thousands of billions of barrels. Previous to the discovery of well oil in Pennsylvania in 1859, there were fifty or sixty plants in the United States distilling oil from black shales and other carboniferous rocks.

Of the oil shale deposits of the United States only the Piceance Creek Basin, in Northwestern Colorado, has been prospected. The rich oil shale measures have been sampled with about 60 core holes. The drilling, plus surface sampling and geological exploration, indicates than an area of 1000 square miles, west of Rifle, Colo., will yield 100 billion barrels of shale oil from the high grade Mahogany Ledge and 500 billion barrels from the 500-ft thick measure of which the Mahogany Ledge is in the lower 100 ft. The presently proved United States petroleum reserves total 33 billion barrels, one-third the expected yield from the prospected part of the Mahogany Ledge. Whereas some do not consider oil shale a liquid fuel at all because they consider liquid fuel production from oil shale uneconomical, those who have studied the subject in detail believe it will be cheaper to produce a new liquid fuel, beyond the amount already developed, from oil shale than from petroleum yet to be discovered. When those who hold the purse strings also reach that conclusion a rapid growth of the oil shale industry can be expected.

The oil shale of Northwestern Colorado, Eastern Utah, and Southwestern Wyoming is part of the Green River Formation of Eocene Age—60,000,000 years old. At that time, the area was a warm, humid, lake studded basin, surrounded by mountains, some of which were active volcanoes. Vegetation grew profusely both on the land and in the water and the lakes were slimy and putrid. Inorganic deposition into the lakes was slow and it mingled and settled with the dead organic matter derived from the land and the lake. Much of the inorganic matter was volcanic ash. Because the lakes were sometimes land locked, their salt content rose to such an extent that at times sodium carbonates and bi-carbonates were precipitated. The combination of the reducing conditions of the lake and the sodium salts resulted in maceration and decomposition of the organic matter so that the plants and, perhaps, animals from which it is derived are largely undeterminable. In certain areas and horizons excellent fossils are found. These are an insubstantial part of the total inorganic matter and may have fallen into and been preserved in the mass of ooze on the lake bottom.

Colorado oil shale is neither shale nor does it contain oil. It is a dense, strong, magnesian marlstone, a dirty dolomitic limestone, which contains up to 40 percent solid organic matter. The waxy, dry, clean, organic matter it contains resembles that found in some cannel coals. Therefore, Colo-



A portable compressor unit travels behind drill carriage

rado oil shale may be thought of as a type of cannel coal containing 60-90 percent limy ash.

When oil shale is heated in absence of oxygen to 750°F., the organic matter decomposes to yield a high carbon residue, condensable gas and non-condensable gas. On cooling, the condensable gas becomes shale oil.

The Piceance Creek Basin, of Northwestern Colorado, is the most thoroughly explored of the former lakes. This basin is now a dissected plateau, 7000-9500 ft above sea level. The saucer-like shape of the original lake is still retained. The oil shale beds, which form the resistant caprock of the plateau, outcrop around the periphery as cliffs and dip gently toward the center of the basin.

Shale oil has been produced commercially for more than a century in Scotland and France. Many other nations have small subsidized shale oil industries. Interest in United States' oil shale revived during World War I, and there was much land acquisition and plant-building in the Piceance Creek Basin for a decade thereafter. The Bureau of Mines in 1925-29 operated a small plant and tested two types of retorts. With the discovery of the vast East Texas and other large oil fields in the late '20's and '30's, and the consequent drop in petroleum prices, interest in oil shale subsided.

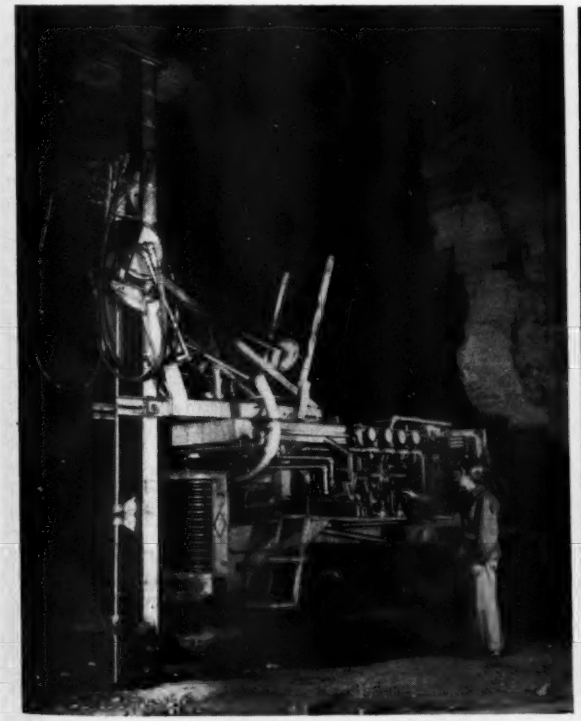
The large increase in the demand for liquid fuel during World War II revived interest in oil shale both by Government and industry. Congress appropriated funds for the establishment by the U. S. Bureau of Mines of an oil shale research laboratory at Laramie, Wyo., and an oil shale demonstration mine and plant at Rifle, Colo. Numerous petroleum, chemical, and construction companies also have done research and experimental work on oil shale. Many of the largest oil companies have acquired oil shale land.

Oil Shale Industry Now

Technical work to date has resulted in the development of: (1) a large-scale, low-cost underground mining method by the USBM; (2) pilot plant scale low-cost continuous retorts by the USBM and the Union Oil Co. of California; and (3) a refining method by the USBM demonstrated on a 200 bbl a day scale and one by the Union Oil Co. of California demonstrated on a one bbl an hour scale.

Mining Method

The mining method developed at Rifle by the USBM fits the oil shale situation throughout most of the Piceance Creek Basin, where commonly the 50- to 100-ft thick flat-lying, 30-gal per ton Mahogany Ledge is overlain by 300 to 400 ft of strong 15-gal per ton shale and above the oil shale are sediments from zero to 1000



A rotary drill is being developed to drill strong rock



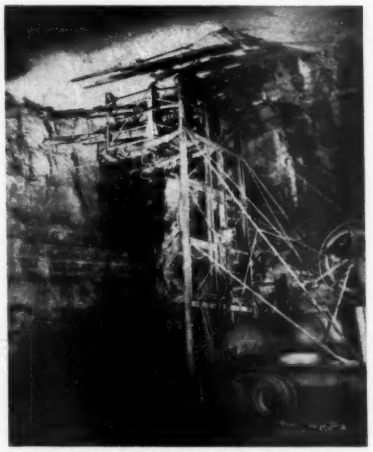
A three-yd shovel loads 22-ton trucks underground

ft thick. Oil shale mining will be started at the outcrop, probably from many closely spaced horizontal openings. The Bureau has demonstrated that the low-grade oil shale overlying the Mahogany Ledge is strong enough to support itself over spans of 80 ft and, consequently, has devised a room and pillar method in which the rooms are 60 ft wide and the pillars 60 by 60 ft square. The top half of the Mahogany Ledge is mined as a heading. The bottom half as an underground quarry. Each half yields 30-gal per ton oil shale.

Breaking

The face of the heading is 40 ft high and 60 ft wide. It is drilled by air operated percussion drills travelling on 15-ft drill sashes. The drill operator can raise or lower the drill platform to any desired elevation of the heading, then point his drill in any desired direction, horizontally or vertically.

Before a round is drilled, the surveying crew marks the center of the face and the correct position for the drill carriage. The drillers drive the drill carriage to the surveyed spot, jack up under the vertical slides until the carriage is level. Drill guide rods are raised to the flat, smooth mine roof. The drillers then mount their platforms, and spot each hole at a predetermined, plotted distance from the roof, in a predetermined angle, both horizontally and vertically, so that each hole is drilled in the proper position in the face. A horizontal V-cut round of 108 holes, each bottomed 15 ft from the plane of the face, is drilled out by two men in an eight-hr shift. The drill carriage has worked out so well that it is being manufactured by several companies



Percussion drills on 15-ft sashes are mounted on mobile platforms

and used in a number of large underground mines.

Compressors on Trailer

Air compressors for the four 4-in. drills are mounted on a trailer and kept with the drill carriage. Consequently, 95-100 psi warm, compressed air is constantly being fed to the drills when they are being operated.

The drill holes, about two in. in diameter, are charged with a 45 percent semi-gelatin ammonia dynamite. Sticks 1¾ in. in diameter are used and each hole is filled about one-third of the distance from the bottom to the collar. The holes are wired in parallel series and are detonated electrically. All rounds are blasted when the men are out of the mine. Between 2000 and 2400 tons of oil shale are broken per round with a dynamite consumption of about 0.4 lb per ton broken.

The charging of the drill holes with dynamite is done from several types of platforms as follows: one that moves vertically up and down vertical slides on the front of a fork-lift type truck; a platform on an inclined boom mounted on the top of a crawler type tractor; and, the latest and best arrangement, an inclined boom on the back of a rubber tired truck. The inclined boom telescopes and is controlled in such a manner that the operator on the platform can move in any direction, in fact, two directions at a time, that is, both up and sideways or forward and sideways. This eliminates the necessity of respotting the truck after loading a few holes. The charging platform also is used for scaling.

Load in Half Shift

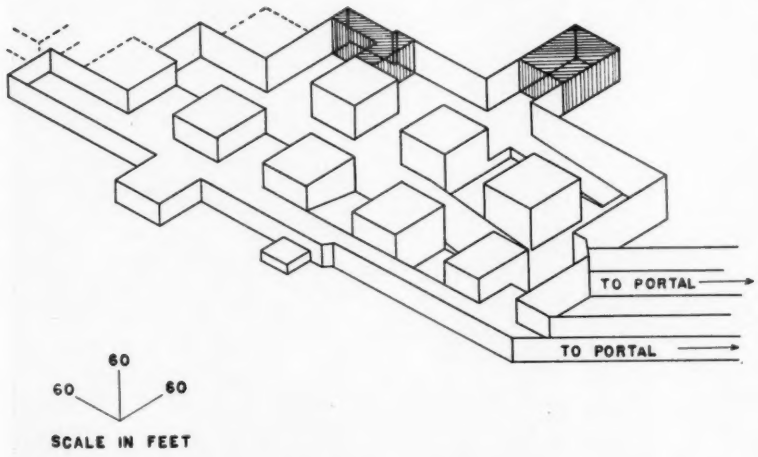
Two men work from these platforms and are able to charge one round in half a shift. No device yet has been developed for a rapid charging of these nearly horizontal holes. Each several sticks are tamped with a tamping stick. Cartridges twelve in. rather than eight in. long have been used and speed the work. Longer cartridges may be used in the future, if available. Pneumatic or mechanical charging means have been considered, but not tried.

After the holes are charged and blasted the fly rock is pushed to the main pile by tractors and the newly exposed rock is scaled. Because the brokn rockpile fills most of the face, very little scaling can be done on the face or on the side wall. If the round is properly drilled, the roof breaks smooth and very little scaling is necessary. The design of the round, the use of millisecond delay caps, and the use of the minimum amount of dynamite result in well broken rounds with little fly rock for the tractors to move.

Move Over 2000 Tons a Shift

Before loading, the broken pile of oil shale is thoroughly wetted to lay dust. The broken rock is loaded by a three-yd electrically operated power shovel. The oil shale is loaded into 15 or 22-ton capacity rear dump truck. One shovel operator can load out the round of 2000 to 2400 tons in one shift. A dozer is used in conjunction with the shovel to clean up spill. The shovel cannot clean up all the broken rock left unloaded by the shovel. This and the additional amount scaled from the face to make the working place safe for the drillers is cleaned up in several ways. By one method the dozer pushes the rock away from the face far enough so that it will not interfere with drilling. A second method employs a front end loader, and the third method an overshot type loader.

(*Continued on page* 105)



Oil shale is mined by a room and pillar method with rooms 60-ft wide and 60 by 60-ft pillars

Pacific Extraction Process



Sulphur is recovered from rock as it passes through asbestos covered tubes at Jamestown, Calif., pilot plant

An Economical Solvent Process for Extracting Sulphur at Atmospheric Pressure in Standard Equipment

By PHILIP R. BRADLEY, JR.
President
Pacific Mining Co.

IN typical Western sulphur ores, elemental sulphur is deposited in voids in more or less porous rocks and in cracks and fissures.

This sulphur will liquefy when heated to a temperature of about 240°F but transmission of heat through a dry mass of sulphur ore is difficult. However, heat can readily be transmitted throughout pieces of the ore crushed small by submerging them in any liquid of sufficiently high temperature, say 240°F.

Water remains a liquid at this temperature if under a pressure of about 20 psig. In the deeply seated Gulf deposits which are large enough to bear the heavy capital burden of equipping for the purpose, sulphur is both liquefied and sluiced from its underground places of occurrence by superheated water under pressure.

However, there are many reasons why the usual Western sulphur deposit is not amenable to this process. These include its typical shallow or surface occurrence, its relatively small size, and the scarcity of water.

In sulphur ore which has been crushed and brought to a place of treatment, the sulphur may be liquefied by any indirect application of heat but to do so as a means of commercial extraction of elemental sulphur is not economic. Indirect application of heat is inefficient and costly. Furthermore, after liquefication of the sulphur there remains the problem of efficient separation of solid and liquid.

Efficient solid-liquid separation is never simple. In the case of sulphur there are added problems. It requires maintenance of high temperature levels without oxidation of the sulphur; it requires especially developed equipment and expert care in its manipulation; it requires complex and expensive equipment made largely of corrosion resistant material. In separating sulphur from rock the force of capillary attraction must always be dealt with within the rock pieces and there is always a film of liquid to be



Water-cooled Precipitator

removed from the surface of the piece —a difficulty increasing geometrically as the pieces are crushed finer and present more surface. Any dust formed from the rock retains liquid sulphur in large proportion, just as mud zealously retains water. While the viscosity of liquid sulphur is very low and permits easy filtering, nevertheless no filtering media can make feasible removal of the finest dust necessary to a product of high purity.

The transfer of the heat necessary to melt sulphur contained in a rock matrix can best be accomplished by using some liquid. The cheapest is water but it must be under pressure. This requires an autoclave which in turn requires careful batch operation.

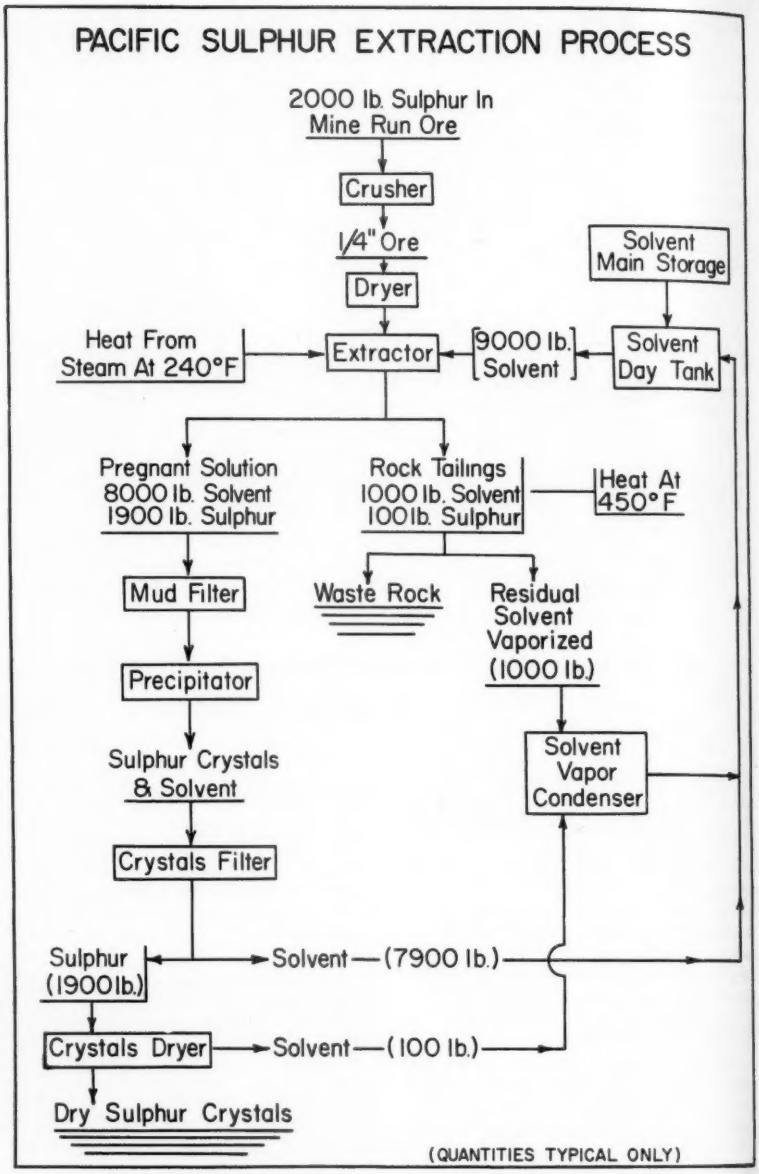
Operation at atmospheric pressure can be carried out, however, by using higher-boiling liquids. These may be hydrocarbons, some of which are solvents for sulphur at high temperatures and their use leads to the simpler and more efficient process of solvent extraction of sulphur from its ores.

Solvent Extraction—General

It should be noted that a solvent extraction plant is simpler in design and operation than any other plant that has been proposed for Western ores; it is continuous; it requires less attention, hence less labor and labor cost; it requires less maintenance than plants operating at super-atmospheric pressures or using complex mechanisms. It should be borne in mind that the major part of the heat consumed in any sulphur extraction plant is due to the absorption of heat by the moisture initially present in the ore. In this respect, solvent extraction is on a par with any other process which raises the plant feed temperature to evaporate such moisture. The circulation of solvent provides opportunity for heat recovery. A solvent plant costs less for equal capacity; the degree of extraction is very high; the product is pure and precipitates in fine crystals which command a premium market.

The solvent is continuously recirculated (as the Pacific Mining Co. does it) and re-used without chemical change or deterioration. In theory there should be no cost of solvent except for the initial charge. In practice no liquid can be continuously circulated in a process plant without some loss, and further, a little solvent will be lost to the solids with which it is admixed. Also, precautions are necessary against undue losses by vaporization because of the working temperature level, about 240°F.

Others have tried at times in the last 15 years to extract sulphur by a solvent process using carbon bisulphide, which is extremely hazardous, without notable success. Beyond these efforts Pacific Mining Co. knows of no other solvent process nor of any other method which has been so well developed or so thoroughly tested as their own.



The solvent process for sulphur readily and cheaply produces a 100 percent U. S. P. pure sulphur, in finely crystalline form if desired. Finely divided sulphur brings a market premium, and the product can include —325 mesh or dusting sulphur. This product is made directly from the typical western ore in one pass through the plant, without additional refining or processing and with very high recovery. The processing cost alone can be as low as $10 per ton, dependent of course on local conditions and rate and grade of feed and especially if this grade is 35 percent, or better. The process is a mechanically simple one, somewhat like the cyanide process for gold ore, though less cumbersome.

Owing to such factors as heat absorption by rock, and really all the general expense related directly to the presence of rock inherent in any ore treatment process, the cost of operation of this process may be thought of as varying directly with the quantity of rock under treatment. In other words, a ton of sulphur is produced more cheaply from an ore containing only 50 percent rock than from an ore containing 70 percent rock. We use an average operating cost of about $12 per ton for typical Western U. S. ores of about 30 percent sulphur content, i. e. 70 percent rock content.

Preconcentrate Plant Feed

The cheaper cost of treating a high grade material turns conjecture toward preconcentration of the lower grade ores. The only feasible means of preconcentration of sulphur ores appears to be flotation. While preconcentration by flotation reduces equipment requirements at the solvent end of a sulphur recovery plant, it increases equipment requirements overall because equipment for grinding as well as for flotation is needed. In operation it adds the expense of grinding the ore and increases power and maintenance expenses. Furthermore, it introduces another and important source of tailings loss.

There is thus a point at which the simplicity of direct leaching of an ore counter-balances the savings to be made by first concentrating and then leaching. This point appears to occur when the grade of ore is between 20 percent and 30 percent, varying with local conditions.

In general, everything else being equal, an ore below 20 percent in grade should be concentrated before leaching, and an ore 30 percent or better in grade should be direct leached. Local factors such as the scarcity of water supply for flotation work have their effect and will determine the precise balance point. The process works extremely well on a 60 or 70 percent flotation concentrate and very cheaply if this concentrate is dry. It would be ideal for treatment of material such as the autoclave-filtration residues left over by the recent Sulphurdale, Utah, operation.

One opportunity for economy, dependent on the nature of the ore, might lie in substituting, in place of grinding, a screening step after crushing, diverting all fines to a flotation unit for preconcentrating and thereafter feeding the flotation concentrate to a solvent plant together with the screen oversize. The recent Sulphurdale operation tried complete rejection of a very coarse oversize but by doing so lost much sulphur. (In this particular ore the distribution of sulphur is fairly uniform throughout a wide range of screen sizes.)

Solvent Process Continuous

Pacific's solvent process is based upon the solubility of sulphur in certain hydrocarbons.

Sulphur dissolves in the hydrocarbons when it is heated and precipitates when the solution is cooled. Ore is continuously mixed with heated solvent, pregnant solution is continuously drawn off, the sulphur precipitated and the resulting crystals separated from the solvent, now barren and ready for re-use.

The ore is crushed to ¼ in. (not ground), and introduced into a sequence of heated digester tubes where leaching takes place under counter current flow of solvent and ore. The pregnant solution is drawn off to a precipitator, passing through a filter on the way. After precipitation the sulphur is recovered, from the resulting mixture of sulphur crystals and solvent, by an ordinary filtration-and-wash sequence in standard equipment. The washing steps require final use of a wash-solvent of low boiling point to displace the residues of primary solvent from the mass of sulphur crystals after first filtration, and this wash-solvent in turn is separated from the mixtures of it and sulphur and of it and primary solvent by allowing it to volatilize under controlled circumstances. The elements of the plant are these:

(1) Ore dressing equipment — ore-bins, crushers, conveyors
(2) Facilities for extraction, including pre-dryer, and for precipitation
(3) Filtration units and solvents separation and recovery units
(4) Storage and shipping
(5) Auxiliary equipment including steam generating plant, vacuum system, cooling system, and the like

It is estimated that a plant unit consisting of these elements to handle 150 tons per day of ore can be built for approximately $150,000, and that if the ore contains 33 percent of recoverable sulphur, 50 tons of sulphur can be produced daily for an operating expense of not over $12 per ton.

The economics of the process depend principally on the use of a solvent properly combining the properties of strength (dissolving power), stability, volatility, safety, and price. They also depend upon a manner of use giving maximum effectiveness with least waste. For proper manner of use, proper equipment is necessary, largely a careful selection of standard units.

A brief description of the process and its mechanisms are necessary to the understanding of the cost analyses. Accordingly, a small pilot plant at Jamestown, Calif., is described. As developed, it parallels closely the intended commercial process plant.

Extraction Unit

There are two tubular conveyors set in tandem, and inclined at about 10 degrees. The crushed ore is dropped into the lower end of the lower tube and moved up through both tubes by screw flights. They are jacketed and heated to 235-240°F. Liquid solvent flows down through them, against the upward movement of ore.

The two tubes communicate but their arrangement effects for the ore a double immersion in solvent in accordance with standard counter-current leaching practice. There is a lower pool of solvent into which dry ore drops and an upper pool where the fresh solvent enters the system. In the lower pool leaching of sulphur is rapid and the concentration of dissolved sulphur is relatively high. The ore travels upward to the upper pool, much of the sulphur already leached from it, and here the concentration of dissolved sulphur is low.

One advantage of a low-concentration last pool is that the quantity of dissolved sulphur, which is carried out in the solution adhering to the rock, is thus reduced considerably.

At the temperature maintained in these tubes, the solvent quickly dis-



Horizontal pipe (upper left) feeds ore into extraction tubes. Pregnant solution comes downhill to vertical cylinder mud-drum

PROBABLE OPERATING COSTS

BASIS

DAILY OUTPUT, 100 TONS SULPHUR FROM A 25% (RECOVERABLE) GRADE OF FEED, I.E., FROM 400 TONS ORE. 12½% MOISTURE CONTENT.

QUANTITIES

Orestream:	8,000 lb ore per ton S produced 6,000 lb rock per ton S produced 1,000 lb H_2O per ton S produced	
Solvent:	9,000 lb in circulation per ton S produced	
Heat:	To raise 4 tons ore to 240°	272 Kb
	Vaporize 1,000 lb water	1,140 Kb
	To heat 9,000 lb solvent to 240°	630 Kb
	To heat rock from 240° to 450° and to vaporize residual solvent	422 Kb
	Solvents separations and other misc. uses	136 Kb
	Per ton S	2,600 Kb
Power:	Daily consumption	7,000 wkh
Limestone:	Added at crushers to neutralize free acid in ore	20 lb
Labor:	10 men, including foreman, mechanic, crusherman, 6 operators, general helper, working 6 days per week, some Sunday turnout	

COSTS			PER TON SULPHUR PRODUCED
Labor:	Per week, including insurance, $1,200		$2.00
Solvent:	65 lb lost @ 6c per lb	$3.90	
	Plus: Wash solvents, if any	1.10	5.00
Heat:	Fuel @ 1c/lb; utilization 10,000 Btu/lb; for 2,600,000 Btu/ton S		2.60
Power:	7,000 kwh daily @ 1c		.70
Limestone:	20 lb per ton S @ 1c/lb		.20
Repair and Replacement:	@ 25% replacement of parts per year on $150,000 in plant, annual cost of R & R is $37,500; per ton S @ 30,000 tons annual		1.25
	Lubricants		.10
Plant Overhead and Miscellaneous:	Office and lab. supplies, communication, local travel costs, local taxes; per ton S		.65

SUMMARY OF OPERATING COSTS	PER TON SULPHUR PRODUCED
Labor	$2.00
Heat	2.60
Solvents and Limestone	5.20
Power	.70
Repairs and Replacement	1.35
Overhead	.65
	$12.50

The foregoing is for direct solvent leaching of a middle grade ore.

The economic feasibility, or the lack of it, in first concentrating the ore by flotation, and thereby sending a reduced quantity of feed to a smaller leaching or solvent plant, is shown by the following estimate of expected operating costs of such treatment:

CALCULATION OF COST OF

(a*) Crushing, grinding, and flotation of 400 tons of ore (containing 100 tons of sulphur recoverable by solvent process) and (b**) Solvent treatment of resulting concentrate (approximately 142 tons containing 85 tons sulphur recoverable by solvent process).

(*) 400 TONS CRUSHING, GRINDING AND FLOTATION MILL			PER TON SULPHUR RECEIVED
Labor:	12½ men avg. $18 per avg. day, per day $225		$2.65
Power:	For crushing, grinding, flotation, dewatering, filtering, pumping per day $104		1.22
Reagents:	@ $.05 per ton of feed		.22
Repair and Replacement:	@ $25,000 annually		1.00
			$ 5.09
(**) SOLVENT UNIT:			
Labor:	4½ men avg. $18 per avg. day, per day $81		.95
Heat:	1500 Kb per ton S @ 0.1c		1.50
Solvent:			4.60
Power:			.30
R. & R.:	@ $15,000 annually		.61
			$ 7.96
			$13.05

Direct solvent treatment of 400 tons of the same ore appears to require a per ton expenditure of only	$12.50
To complete the comparison between treatment in a plant using solvent extraction only and treatment in the combination plant, to the basic combination plant figure above of	$13.05
There must be added:	
Overhead cost	.60
Additional depreciation	.20
Additional mining cost (due to 15% tailing loss of sulphur)	.50
Total probable cost of comparable combination plant operation	$14.35

solves all elemental sulphur present in the typical western ore. This is all the sulphur any economical process will get. Incidentally the occurrence of the sulphur in these ores is similar to its occurrence in the Texas and Louisiana formations, but the plant treatment herein described will give much higher degree of recovery of sulphur from the rock than do the wholesale deep-well methods of the Gulf.

In solvent extraction work one element is too often overlooked. This is the problem—the economic importance of the recovery of solvent from the rock after the two have become mixed together in the digestion process.

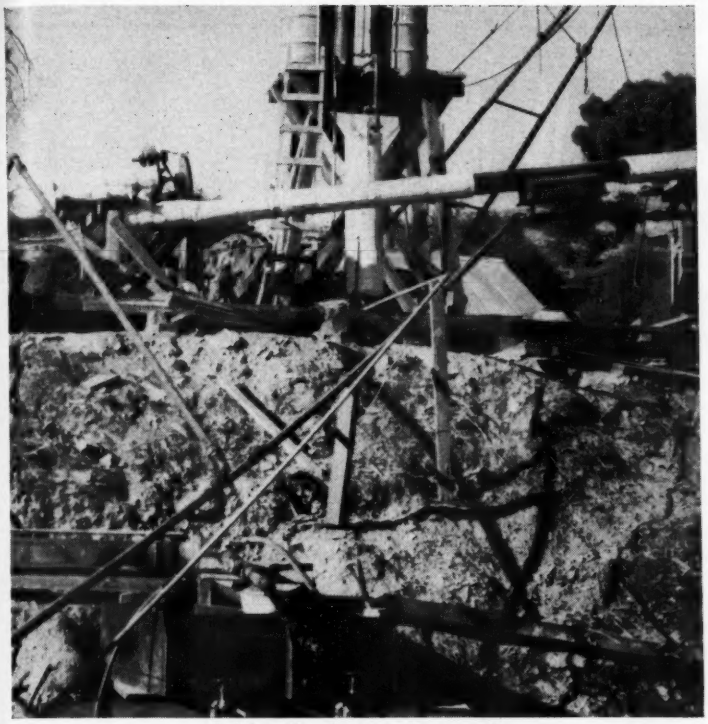
Sulphur rock is porous by nature or it would not have received sulphur in the first place; the porosity increases on removal of the sulphur. Such a rock after being submerged in a liquid and then removed will still retain a large quantity of free liquid even when fully drained by natural means. This quantity may amount to as much as 40 percent of the weight of the rock. (This tends to dictate a minimum quantity of total solvent and thus to limit the usefulness of strong solvents.) The plant design includes a means for improving drainage.

The second of the two immersions in the counter-current system is in fresh solvent, diluting the sulphur-bearing solvent coming over with the rock from the first immersion and ensuing that the solvent that goes with the rock out of the digestion system does not carry a high concentration of sulphur.

Mechanical refinements along the line see to it that the quantity of liquids staying with the rock is somewhat less than if simple drainage were relied upon. When measured in the pilot plant work, the proportion of liquid to solid was low. This is important to the economy of the process.

Recovery of Solvent

The solvent used is selected for its vaporization temperature, among other things. It must not vaporize so readily as to be subject to vapor loss as it circulates at the process working temperature. It must however vaporize readily when the temperature is intentionally raised for that purpose at the end of the upper or last digester tube. For a process plant, a separate vaporizer tube is intended. By such



Sulphur filter boxes in foreground

intentional vaporization, the residual solvent is removed from the rock as a gas and recovered by condensation and returned to the circuit.

The quantity of solvent ultimately remaining in the discarded rock from which the solvent was so recovered was so low in laboratory work as to be unmeasurable. The same was true of the quantity in samples of rock discharged from the pilot plant when the plant was in good operating order.

Precipitate Sulphur from Solution

Pregnant solution flows out of the lower end of the extracting tubes by gravity. Finely divided rock tends to accompany this liquid. Construction at the lower end of the lower tube settles much out, and removes it. A fine screen and second settler in the pilot plant removed the rest of these fines and a clear solution consisting only of solvent and dissolved sulphur flowed to the precipitator. In a process plant we would substitute for the second settler and screen a suitable and standard oil-filtering device.

Our sulphur solvent loses its power to dissolve as its temperature drops. On cooling the solution the sulphur precipitates in fine crystals. The mechanism for the purpose is simple and worked effectively without attention at Jamestown. Cold water was used to reduce the temperature without mixing of water with solution or sulphur.

Two means of precipitation actually are possible, the cold-wet form and a hot-dry form. Both produce fine pure sulphur crystals. The cold-wet form was used at Jamestown. It readily knocked down all the sulphur, producing a mixture of cold solvent and very fine sulphur particles. The very fine (—325 mesh) sizes bring considerable selling premium. The cold sulphur-solvent mixture permits easy separation of extreme fines by wet screening, a distinct advantage. Furthermore, cold-wet precipitation is best where only "brimstone" sulphur is required, because after filtering on standard equipment to remove all but a small proportion of solvent, the sulphur crystals are melted to brimstone whereupon the residual solvent vaporizes and can be fully recovered. Where crystals are wanted, filter-washing is necessary after cold-wet precipitation, both to clean the product and to recover solvent.

Hot-dry precipitation has not been experimented with by us except on a laboratory basis. It holds promise but has more operating complications and is not at present recommended. In the hot-dry method precipitation is by evaporation recovering separately but at once, both a dry fine crystal, pure if there were no soluble organics present in the ore, and the solvent.

Operating Cost of a Plant

This can be divided into

(1) Labor including direct supervision and insurance chargeable to payroll.
(2) Fuel (Heat).
(3) Solvents (make-up solvent) and limestone.
(4) Power.
(5) Repair and replacement.
(6) Local overhead.

Conclusion

The foregoing examples illustrates the type of cost analysis necessary in choosing between solvent treatment of a sulphur ore concentrate by flotation, and solvent treatment of mine-run ore. While availability of water supply for concentration purposes and other like factors have their effect upon the choice, nevertheless it appears that for ores below 20 percent in grade the cost favors the combination method involving concentration in some form; above 30 percent cost analysis indicate the desirability of straight solvent treatment. The cost of the latter drops off markedly as the grade of the feed increases.

In comparing the prospective costs of solvent treatment of a typical sulphur ore with those of any other method, the solvent method appears to have a definite edge in the matter of initial cost of plant. The best cost of the solvent method looks high at first glance, but about half the required heat goes into raising the temperature of the ore above the boiling point of water and the evaporation of the moisture in the ore, and this quantity of heat is common to any process requiring much temperature levels.

Very careful design and operation of a solvent plant could reduce the loss of solvent to a very low figure, but cost estimates should include an adequate allowance for solvent loss.

The above estimates of solvent quantities and losses for the first of the above examples should be of interest.

Quantity of Solvent to Circulate, Per Ton Sulphur:	
To dissolve 2000 lb sulphur	7200 lb solvent
To be entrained with 6000 lb tailings	1000 lb solvent
Working excess	800 lb solvent
	9000 lb solvent
Solvent Losses, Per Ton S:	
1½% of tailings content	15 lb solvent
Loss in sulphur	5 lb solvent
Circulation loss, ½% of 9000 lb	45 lb solvent
Total loss, per ton S	65 lb solvent

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15	motor generator sets, motors, panels, switches
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7	high pressure and portable rock dust distributors
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60	mine telephones and trolley phones
883	pit cars and steel ore cars
768	trip lamps, cap lamps and safety flame lamps
25	transformers, 1½ to 25 KVA
1	sand dryer

For further details, write directly to:

Mr. I. N. Bayless, *President*
The Union Pacific Coal Company
Union Pacific Building
Omaha 2, Nebraska

or

Mr. I. M. Charles, *Chief Engineer*
The Union Pacific
Coal Co.
Rock Springs, Wyoming

Get Ready For Summer Operation

By D. K. HEIPLE
LeTourneau-Westinghouse Co.

SUMMER'S hot temperatures will soon be with us, so now is the time to be thinking about preparing your equipment for hot weather operation. The following suggestions will help you get your machine prepared and keep it working at top efficiency throughout the hot season.

Cooling System—One of the most important things to check is the cooling system. The operating temperature of the water and lubricating oil in the engine should not exceed 180° F. To be sure that your engine does not overheat check to see that your cooling system is in good condition. Drain and flush it thoroughly. In this way you'll remove accumulated rust and contamination and insure good circulation for proper cooling.

If cleaning is needed sal soda is a very effective and safe solvent for removal of lime scale and other foreign deposits in the cooling system. Use it according to the directions printed on the container in which it is purchased. After cleaning, drain the system completely and flush with clean water when the engine has cooled sufficiently. Use a neutralizer solution if the solvent used requires one.

After cleaning and flushing the cooling system look for leaks in radiator, hose or connections. Make sure connections are tight. Repair or replace damaged parts.

Rust Inhibitor—It is a good idea in summer to add a rust inhibitor to the cooling system to prevent rust formation. Keep the cooling system filled with clear water that is free from lime or alkali. The use of water containing lime will result in lime deposits in the cylinder head and block, causing hot spots in the engine and eventually restricting the water passages. Alkali in the water will cause a corrosive action detrimental to various parts of the system.

Radiator—If the fins of the radiator are clogged with dirt and debris they can be best cleaned by means of a stream of air or water. For machines with puller type fans the air should be forced through from the back or fan side to the front side of the core. The opposite is true for machines with pusher type fans. Here the air should be forced through the front side to the back or fan side of the core.

Water Pump—Make sure that the water pump is in good condition. See that the water pump and/or fan belts are not slipping. Belts have proper tension when they can be pushed down approximately ¾" with normal thumb pressure.

Engine—Keep the outside of the engine wiped off clean. No engine will operate properly under a blanket of dirt.

Make sure that the bottom of the engine compartment is cleaned out. If dirt, oil and other debris are allowed to accumulate they can restrict air circulation and hinder cooling of the generator and torque converter.

Oil—Drain heavy winter-weight oils from the engine crankcase, transmission, final drive and electric motor gear boxes. Flush these components with a good flushing oil to remove sediment and sludge. Refill with good quality summer weight oil. Refer to your equipment manuals for recommended oil weight. Don't try to economize by using winter weight oil in summer. The lighter oil will not lubricate properly and expensive damage to equipment can result.

Paint—Unpainted surfaces rust easily. Clean and paint surfaces where paint is worn off or where welding has been done.

Tires—Check for cuts or breaks in tires. Keep tires properly inflated.

Battery—Check battery water level and voltage reading at frequent intervals. Keep batteries well charged.

Daily Checks—Each morning before operating your machine, perform all recommended preventive maintenance service. This should include not only necessary lubrication but you should also make it a habit each morning to check tire pressure, battery water level and oil level. If you don't have a lubrication chart for your machine, write for a copy.

By following these tips and taking care of your equipment, you'll find that your operation of equipment will be easier during summer weather.

Remember, your equipment is your way of making a living . . . take good care of it.



Daily checks add up to longer equipment life

what happens when electrical failure ties up production at The Sunday Creek Coal Company? **Purchasing Agent E. H. Robinson says:**



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ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES



Wheels of GOVERNMENT

AMC

As Viewed by HARRY L. MOFFETT of the American Mining Congress

DESPITE protracted McCarthy-Army hearings, Congress is making real headway in its efforts to write the President's legislative program into law before adjournment. Such major planks in that program as social security revision, tax law overhaul, Federal housing aid, revampment of the contract renegotiation statute, and broader use of atomic energy are fast approaching floor action.

One major legislative victory has already been achieved by the President—authorization for the St. Lawrence Seaway. The bill setting forth this authority passed the House early in May and was signed by the President. Its passage resolved a 50-year old controversy.

Of particular interest to the mining industry are upcoming decisions to be made by Congress in the fields of tax revision, Tariff Act extension, contract renegotiation, and public land law amendment. Action in all of these fields is expected prior to the lawmakers' return to the hustings this summer.

T-H Amendment Unlikely

Not all of the President's program is having smooth sailing. On May 7, the Senate dealt what may well be the coup de grace to the Administration bill to amend the Taft-Hartley Act. By a vote of 50 to 42 it recommitted the measure to the Senate Labor Committee, a move which normally signals consignment of a bill to the legislative deepfreeze.

The recommittal action came before the Senate had an opportunity to consider proposals to give the States more power in labor matters and to require secret strike ballots. Both of these suggested amendments had a good chance of being written into any revision measure.

On the heels of the Senate's action, it was announced by Administration spokesmen that no further steps would be taken to press for amendments to the law in the immediate future. House leaders had already declared that they would not schedule floor action on any revision bill unless there was a good possibility that the Senate might later take some "real action."

Most legislators breathed sighs of relief that the matter was disposed of for this session. Likewise, industry spokesmen expressed the opinion that it was far better to leave the present law unchanged than to see some of the weakening amendments, supported by the Administration, placed upon the statute books.

Meanwhile on the labor front, Congress has before it two Administration bills which would outlaw Communist-dominated labor unions or business concerns, and enable the Government to ban subversives from privately-owned facilities which are important to national defense. Whether or not the Administration can enlist enough support for their passage at this session is still in question at this time.

Union welfare funds and their handling are also to come under close Congressional scrutiny. Chairman McConnell of the House Labor Committee has named a nine-man committee, with himself as chairman, to investigate such funds. The Committee will have $75,000 to conduct the inquiry, which will begin early in June. Other members of the committee are Reps. Smith (Rep., Kans.), Bosch (Rep., N. Y.), Holt (Rep., Calif.), Rhodes (Rep., Ariz.), Barden (Dem., N. C.), Lucas (Dem., Tex.), Wier (Dem., Minn.), and Miller (Dem., Kans.).

Tax Revision

Following conclusion of open hearings on the revenue revision measure the Senate Finance Committee went into a series of closed sessions to overhaul portions of the measure which had come in for criticism by witnesses.

The Committee expects to have the bill before the Senate early in June and the leadership is driving hard to get the huge measure to the White House as soon as possible. The expected fight over the boosting of personal exemptions seems to have died aborning and Treasury officials have expressed the view that the bill as finally enacted will be close to the desires voiced by that Department.

Numerous technical changes have been made by the Finance Committee. Some of them of particular interest to the mining industry deal with depletion provisions. Most depletion rates provided in the House bill were approved by the Committee. However, the committee boosted to 23 percent the rate for uranium—the House had okayed a 15 percent rate, as in present law. It raised to 10 percent the depletion rate for salt, provided a 15 percent rate for building stone or ornamental stone, approved a five percent rate for all types of limestone if used for road purposes and a 15 percent rate for limestone if used for other than road purposes. While the House had relaxed present rules for applying depletion allowances to permit a taxpayer to treat as one property for percentage depletion purposes a group of separate properties which constitute one operating unit, the Finance Committee further liberalized this to extend the same combination provision to a taxpayer who uses cost depletion.

The Committee also continued the present 27½ percent depletion rate for

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Washington Highlights

T-H AMENDMENTS: Pigeonholed.

TAX REVISION: In Finance Committee.

LEAD-ZINC: Tariff Relief Recommended.

TARIFF EXTENSION: President Eases Request.

MINING LAWS: Revision hearings held.

MINERALS ADVISORY COUNCIL: Viewed doubtful.

COAL PROGRAM: Suggested to Administration.

STOCKPILING: Some goals lifted.

★ ★ ★ ★ ★ ★ ★

oil and gas and the 23 percent rate for sulphur, defeating a drive to lower these to 15 percent. In other decisions, the Senate Committee extended the present 52 percent corporate tax rate to March 31, 1955; placed the burden of proof upon the Government to show that corporate surpluses are unreasonable; continued existing capital gains treatment; retained the present laws' provisions governing consolidated returns; and made changes in the tax treatment of foreign income.

Most observers believe that the measure should reach the President by early July.

Lead-Zinc Tariff Relief

It is reliably reported at this writing that the U. S. Tariff Commission has sent the President its recommendations on the lead and zinc mining industry's application for relief under the "escape clause" provisions of the Trade Agreements Act. It is indicated that the Commission has recommended that the President provide tariff relief by increasing the present rates.

Details as to the exact recommendations made have not been announced by the White House although many on Capitol Hill are urging that they be made public promptly.

Indications that the Commission would take this step were contained in its previous report to the Senate Finance and House Ways and Means Committees on its general investigation of the situation existing in the two industries.

One Year Trade Act?

Growing rumblings in Congress of an all-out effort to provide protection for hard pressed domestic industries through an overhauling of the Trade Agreements Act were recognized by the President in mid-May, when he disclosed that he would accept a one-year extension of that Act in lieu of his more far-reaching tariff program. His position was made known in a letter to Charles H. Percy, head of a group of business leaders who had advocated adoption of the Randall Commission's tariff recommendations.

Several measures have been introduced in Congress which would empower the Tariff Commission to increase or reduce tariff rates or to impose or withdraw import quotas, subject only to Congressional veto. This would take from the President his present power over tariff actions. These measures would also put a quota limitation upon foreign residual oil, and kill off the General Agreement on Tariff and Trade (GATT) on June 30, 1955, unless Congress specifically approved that agreement.

Other measures have also been tossed into the legislative hopper to put import quotas on lead and zinc, and a number of other industries feeling the impact of foreign products are clamoring for tariff aid.

Most Capitol Hill observers feel that the President will be lucky to get a one-year extension of the present Act, with the betting about fifty-fifty that the law will be changed to allow less Presidential discretion in the matter of ratemaking.

Mining Law Revision

Subcommittees of both the Senate and House Interior and Insular Affairs Committees held hearings in mid-May on identical measures designed to resolve the conflicts between the mining laws and the Mineral Leasing Act, which is particularly acute in the uranium mining area of the Colorado Plateau, and to clear up a legal cloud over the right to locate mining claims for uranium and other fissionable minerals.

Government witnesses from the Interior Department and Atomic Energy Commission joined forces with representative of the mining and oil industries in support of the measures and urged their prompt adoption.

Interior Department spokesmen said that adoption of the proposed bill would open 50 million acres of public lands, now held under oil and gas leases, to mining locations. The AEC said that the opening up of Mineral Leasing Act lands to mining location would spur the search for fissionable materials, and that a provision making it clear that mining claims can be based upon location of such materials will do much to reassure the industry.

Clair Senior, Salt Lake City attorney, representing the American Mining Congress, explained the various provisions of the bill and its effects upon mining claimants and operators under the Mineral Leasing Act. He said the bill provides for the location of mining claims upon lands under oil and gas leases, reserves the Mineral Leasing Act minerals to the Government, establishes a procedure whereby valid mining claims on oil and gas leases may be determined, provides for a transition from AEC's current leasing of uranium tracts to a mineral claim status, validates certain mineral locations made under Public Law No. 2.0, and establishes the definite right to locate mining claims for fissionable materials. He told the Committees that the measure was the result of more than a year's work on the part of a group of individuals representing uranium and other branches of mining as well as the oil and gas industry.

Others from the mining industry who endorsed the bill included William G. Waldeck, Colorado Plateau Uranium Committee; Robert S. Palmer, Colorado Mining Association; Kenneth Kellar, Homestake Mining Co.; Charles A. Steen, Utex Exploration Co., and Steve McNichols, Uranium Ore Producers Association.

Early action is expected on the measure in both Houses.

Meanwhile, Senators Dworshak (Rep., Idaho) and Anderson (Dem., N. M.) have introduced a bill designed to clear up abuses of the mining laws. It would remove common varieties of sand, stone, gravel, pumice (excluding block pumice), and cinders from under the mining laws; ban use of any mining claim, prior to patenting, for any purpose other than mining and allied operations; permit the U. S., prior to patent, to use the surface for forage control, right-of-way to adjacent land, forest protection, and to cut mature saw timber of 18 in. or more in diameter. All of these provisions would apply only to future mining locations.

The measure may be the subject of hearings by the Senate Interior Committee in the near future.

Minerals Advisory Council?

A House Interior Subcommittee held a hearing early in May on measures by Reps. Engle (Dem., Calif.) and Miller (Rep., Nebr.) which would reestablish a National Minerals Advisory Council in the Interior Department.

The Interior Department urged the creation of a new council to replace that abolished shortly after the war. Department spokesmen urged that the proposed measures be amended to provide for a Council of up to 50 members (the bills called for a ten-member Council) and to authorize an appropriation for operating the Council.

Members of the subcommittee voiced considerable doubt as to the need for such a body, contending that numerous mining organizations and industry representatives are readily available to advise the Secretary of Interior upon mineral matters. They also declared that it would be a precedent-setting move to authorize funds for such an organization, which would probably lead to heavy outlays by the Federal Government should other industries seek similar Councils.

The committee took no action on the measures and is awaiting further reports from the Interior Department. Chances are believed to be slim that such a bill will get through Congress this year.

Coal Program Outlined

Representatives of the coal industry have met with Interior Department officials in an attempt to secure Government aid, other than financial, to resolve some of the problems facing it at this time. The industry-sought Government action to reduce freight rates, to procure U. S. coal for Japan, to purchase more domestic coal for military and atomic energy installations, to impose quota restrictions on foreign residual oil, and to get Eu-

(*Continued on page* 104)

AMC Personals

A. R. Matthews, president of Pocahontas Fuel Co., announced that the Board of Directors of the company has elected **A. Vernon Sproles** to the position of vice-president in charge of operations. He has been general superintendent of mines for the past ten years. **P. P. Ferretti,** assistant general superintendent of mines was appointed to succeed Sproles as general superintendent.



A. V. Sproles



P. P. Ferretti

W. Lunsford Long, president of the Tungsten Institute, and vice-president and general counsel of The Tungsten Mining Corp., Haile Mines, Inc., and Manganese, Inc., has returned to the United States from a two months' trip to mining areas of South America.

Long reported that he was not surprised to find that the costs of producing tungsten in Argentina are close to those in this country. The high cost of transporting machinery, materials and supplies from point of purchase to the seaports, and then to the mines, offset the lower wages in some South American areas.

Stanley B. Johnson, president of The Lorain Coal and Dock Co., Columbus, Ohio, has been elected president, chairman of the Board of Directors, and chairman of the Wage Scale Committee of the Ohio Coal Association.

Tom Lyon, until recently director of the Domestic Expansion Division of the Defense Materials Procurement Agency, has joined Southwestern Engineering Co. as a consulting engineer.

Francis O. Case., president of Glen Alden Coal Co., announced the election of **Wentworth P. Johnson** to the Board of Directors of Glen Alden. Johnson succeeds Gurdon W. Wattles who resigned in November, 1953.

Changes in the Mascot organization of the American Zinc Co. of Tennessee were announced recently by Howard I. Young, company president. The Board of Directors elected **Harley A. Coy** to the position of vice-president of the company. **William Black** was promoted to manager of the American Zinc Co. of Tennessee's operations.

W. J. Jackson, affiliated with the Lillybrook Coal Co. for the past 26 years, has been appointed secretary-treasurer of the Elkhorn Coal Co. with offices in Charleston. Jackson retains his position as assistant secretary-treasurer of the Lillybrook firm.

Harold M. Jacquet has been promoted to vice-president and general manager of the Pan American Sulphur Co. He has been general manager and director of sulphur operations since January.

The Utah Coal Operators Association has elected **David A. James,** vice-president and general sales manager of Liberty Fuel Co., as its new president. He succeeds **Walter F. Clarke.**

Election of **Leland B. Flint** of Salt Lake City, Utah, as a director of Kennecott Copper Corp. has been announced by Charles R. Cox, president.

J. Q. A. Price has been elected president of the Elkhorn Mining Co., succeeding **Wade V. Lewis. Floyd L. Lewis** succeeds **J. T. Lewis** as secretary-treasurer of the company.

Charles E. Tonry has been named director of the Processing Division of the Grand Junction Operations Office of the U. S. Atomic Energy Commission at Grand Junction, Colo. Tonry comes to the AEC from the U. S. Bureau of Mines at Rifle, Colo. **Edwin H. Crabtree, Jr.,** for the past seven years director of milling for the Eagle-Picher Co., Mining and Smelting Division at Miami, Okla., has been named deputy manager of the Grand Junction office.

Consolidation Coal Co. (Ky.), Division of Pittsburgh Consolidation Coal Co., announces the promotion of **James Cannon** from assistant mine foreman to mine foreman of its Mine 214.

Boris Ashurkoff and **Cyril Heiss** have recently received new appointments at the western operations of United States Smelting Refining and Mining Co.

Ashurkoff, who had been industrial development engineer since January, 1953, was named chief mechanical engineer of western operations. Heiss was named mechanical engineer. He joined the engineering department of the company in 1935 and held successively the positions of draftsman, engineer and assistant mechanical engineer.

Joseph A. Lewis has resigned as superintendent of Riffe Branch No. 4 mine of Winding Gulf Collieries after 34 years' service with the coal industry of southern West Virginia. Appointed to succeed Lewis was **E. V. Bowman,** formerly superintendent of the Winding Gulf at its Goodwill mine in Mercer County.

The Board of Directors of the Climax Molybdenum Co. has elected **Weston G. Thomas,** executive vice-president, **Frank Coolbaugh,** vice-president, Western operations; **Alvin J. Herzig,** vice-president, research; **Wallace Macgregor,** treasurer, and **George P. Fillius,** assistant treasurer. **Carl M. Loeb, Jr.,** resigned as vice-president in charge of sales and research but remains as a member of the board of directors and as chief technical adviser to the company.



W. G. Thomas



F. Coolbaugh

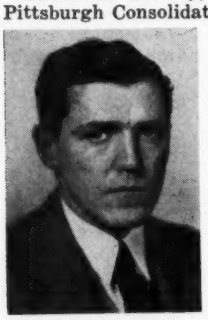


A. J. Herzig

Warren F. Leatherman, executive vice-president of the Crozer Coal and Land Co. and the Page Coal and Coke Co. has been elected president of both companies. **Robert T. McCracken,** was elected a vice-president of the two companies and **L. Rodman Page, Jr.,** vice-president and secretary.

H. V. Kruse, chief engineer of the mechanical department, Phelps Dodge Corp., has retired after 29 years of service with the corporation.

Samuel M. Cassidy, vice-president of Pittsburgh Consolidation Coal Co. has been elected president and a director of the Renton Coal Co., by action of its board of directors. Cassidy succeeds **G. A. Shoemaker**, executive vice-president of Pittsburgh Consolidation Coal Co., who will remain a director of Renton.



S. M. Cassidy

The Renton Coal Co. is jointly owned by Great Lakes Steel Corp. and Pitt Consol.

Burdett Gibson, formerly with Goodman Manufacturing Co., has been appointed assistant director of the Agricultural, Construction and Mining Machinery Division of the Business Defense Services Administration, filling the vacancy caused by the death of Paul Moyer.

Gibson will be concerned primarily with the Mining Machinery Branch of the Division. It will be his responsibility to see that mining manufacturers holding defense contracts receive the necessary supplies of steel, copper and aluminum to meet contract requirements.

Peter Joralemon, superintendent of mines and director of New Park Mining Co., has announced his intention of leaving that firm July 1 to join his father, **Ira Joralemon**, in San Francisco in consulting work.

C. W. Allen, vice-president—Mining Operations, The Cleveland-Cliffs Iron Co., announced the retirement on March 1 of **E. L. Derby, Jr.**, as chief geologist. Derby will continue, however, on an active consulting basis.

S. W. Sundeen was promoted from assistant manager of the Mining Department to manager, Ore Development, effective March 1. He will head the company's increasingly important low grade ore development program in Michigan and Minnesota.

Burton H. Boyum was promoted to the position of chief geologist and **Gerald Anderson** from senior geologist to Michigan District geologist.

President T. G. Gerow of the West Virginia Coal & Coke Corp. announced that **R. F. Duemler**, vice-president in charge of sales, has accepted a position with a national manufacturer.

W. C. Batchelor has taken over as general sales manager and will direct company sales. **W. F. Gerth** was appointed assistant general manager of Sales and **I. C. Ball** manager of sales, River Division.

On May 1, **Frank A. Ayer** moved his offices to 21 East 40th St., New York 16, N. Y.

Lloyd W. Ingles has been named superintendent of the Colorado Fuel and Iron Corp.'s new Allen Mine at Weston, Colo. He succeeds **H. D. Pinkney** who has resigned.

Ingles has been superintendent of CF&I's Fredrick Mine since August, 1951, following two years as superintendent of the corporation's Kebler and Pictou Mines. He also served as superintendent of CF&I's Crested Butte for three years and had been superintendent of the Kebler Mine once before in 1934.

Marvin Kay, vice-president and general manager of Climax Uranium Co., Grand Junction, Colo., has been elected president of the Colorado Mining Association. He succeeds Harold Worcester who died a day or two after his election in January.

The Paul Weir Co. announces the election of **Paul Weir** as chairman of the board and **Clayton G. Ball** as president.

J. T. Sherman is now head of the Metals Process Section of the Sales Department of Chemical Construction Corp. He will be charged with negotiating agreements covering installation of plants to utilize techniques developed by the Metals and Process Section for extracting metals and metallic compounds from ores, concentrates, alloys and scrap by new hydrometallurgical processes.



Walter F. Clarke, assistant general manager, Independent Coal and Coke Co., has retired from that company.

On June 30, **Bernard N. Zimmer**, vice-president and director of the American Metal Co., Ltd., will retire as vice-president of that company. He will then have completed 40 years' service with the company.

— *Obituaries* —

Frank E. Mueller, president, Roberts and Schaefer Co., died unexpectedly of a heart attack in Chicago May 21.

Mr. Mueller began his business career in 1901 with Link-Belt Co. In 1903 he joined Roberts, Schaefer & Co. which became Roberts and Schaefer Co. in 1904. He served progressively as chief engineer, general superintendent, secretary and sales manager, vice-president, and in 1941 was named president. He had announced plans to retire at the end of this year after rounding out 50 years of service with the company.



In addition, Mr. Mueller had long been active in the Manufacturers Division of the American Mining Congress, his company being one of the charter members. He was a member of the Board of Governors of the Division for over 20 years.

Charles W. Staacke, of Buffalo, N. Y., outstanding authority on conveyor belt design, construction, and installation, died April 9, at the age of 56 in Detroit, Mich. He was technical advisor on conveyor and belting sales for Hewitt-Robins, Incorporated.

Arthur M. Jensen, pioneer Blaine county mining man, died at his home in Hailey, Idaho, April 11. Mr. Jensen is credited with developing the Triumph mine into one of Idaho's leading lead-zinc-silver producers. He was president and manager of the Snoose Mining Co. at the time of his death.

George J. Young, 77, widely known mining engineer and for years editor of the *Engineering and Mining Journal*, died in Oakland, Calif., April 7.

Edgar F. Schaefer, 58, president of the Gardner-Denver Co. and widely known as an industrial leader, died suddenly at his home in Quincy, Ill., May 2.

Mr. Schaefer first joined the Gardner-Denver Co. in 1919 as cost clerk. Through rapid promotions, he became export manager and then assistant sales manager. In 1926 he was made vice-president in charge of sales and was named as a member of the Gardner-Denver board of directors. He was elected executive vice-president in 1942 and became president five years later.





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This is the kind of track that gives a mine official no worries at all. It is well planned, well made, well laid out. The part you see here—neat, trim, and compact—is typical of the whole system.

It's a Bethlehem prefabricated job, designed not only for present needs but those of the future. Working in close co-operation with the mine owners, Bethlehem studied every detail of the haulage problem; then designed the trackage and made the components. Rails were precut and precurved, with lengths and radii calculated exactly. Every element, down to the last bolt and nut, was selected to fill a particular need.

The system shows an advanced degree of planning and the highest level of workmanship. It can handle a large volume of high-speed traffic, with consistently low upkeep expense. It is a system free of the haulage snarls that are often so costly in man-hours and money.

Track like this pays off in a very short time. Why not ask us for full details? We can design and furnish you the whole layout, complete with rails, switches, switch stands, frogs, guard rails, braces, joint bars, and even the fastenings. Call for a Bethlehem engineer; he'll gladly come to your office and tell you how we work.

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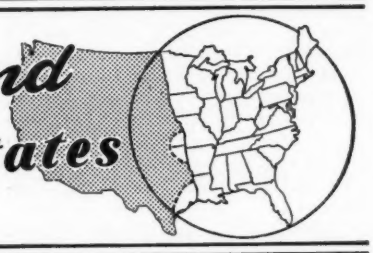


BETHLEHEM PREFABRICATED TRACK

NEWS and VIEWS



Eastern and Central states



Goes to Turkey

Dr. Edward Steidle, dean emeritus of the College of Mineral Industries at the Pensylvania State University, and chairman of the Federal Coal Mine Safety Board of Review is on a two-month special assignment in Turkey.



Dr. Ed. Steidle

The government of Turkey has requested Dean Steidle to study its Mining Research and Exploration Institute and to assist with recommendations of needs in development and reorganization of the institute.

This institute corresponds to the Bureau of Mines plus Geological Survey in this country. The assignment was arranged by Foreign Operations Administration.

Coal Trains to Run Soon

Work is progressing rapidly on the 14-mile track extension of the Nicholas, Fayette and Greenbrier Railroad to permit development of a southern West Virginia coal field estimated to contain 85,000,000 tons of coal. The railroad, owned jointly by the New York Central and the Chesapeake & Ohio, is being extended primarily to haul coal from Royalty Smokeless which is building a cleaning plant near Clifftop, W. Va. Other coal firms in that section of Fayette County also may take advantage of the track extension later. Crews are now laying track on the last three miles to the cleaning plant. Grading for track from the cleaning plant to the mine at Landisburg, W. Va., is expected to be finished about the middle of July.

20th Anniversary

The Thirty First Annual American Mining Congress Coal Convention in Cincinnati May 3-5 also marked the 20th anniversary of the U. S. Steel Corp's headquarters suite, the "Tiger's Lair." John Graham, general manager of sales, American Steel and Wire Division, originated the idea and serves as official host for the Steel Corp. and its participating divisions. The divisions sponsoring the Tiger's Lair this year were the American Steel and Wire Division, National Tube Division, the Tennessee Coal and Iron Division, and the producing unit of the U. S. Steel Corp.

White Pine Production in '54

At the annual meeting of the Copper Range Co. held in Boston May 6, the stockholders were told that the company's White Pine property near Ontonagon, Mich., is expected to produce copper the latter part of this year. Construction is running on schedule and that calls for a limited amount of copper production in November and December. However, the mine will not be producing at designed capacity until 1955.

Beryl Supply Now Adequate

Domestic consumers of beryl used less than ⅓ of the total supply available during 1953, according to a report made recently to Secretary of the Interior Douglas McKay. Beryl is the sole commercial source mineral of the strategic metal beryllium.

Last year's new supply of nearly 9000 tons of beryl was the largest in history, with domestic consumption totaling only 2662 tons.

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Zinc Institute Elects Officers

At the annual meeting of the Board of Directors of the American Zinc Institute, Marshall L. Havey was re-elected president. Havey is assistant to the president of The New Jersey Zinc Co. in New York City.

Also reelected for a second term of office were three vice-presidents: Warren H. Leverett, National Zinc Co., Inc., New York City; George W. Potter, Potter-Sims Mines, Inc., Joplin, Mo.; and Frank A. Wardlaw, Jr., International Smelting & Refining Co., Salt Lake City. Erle V. Daveler, American Zinc, Lead and Smelting Co., New York City was reelected treasurer and Ernest V. Gent continues as executive vice-president and secretary.

New Power Plant

Construction of a new electric generating plant of 424,000-kw capacity, soon to be started in Mercer County, in Central Kentucky, will create an annual market for 1,080,000 tons of bituminous coal, according to engineering estimates. The plant will be built by Kentucky Utilities Co. to fill rising power demands resulting from a post-war expansion in Kentucky industry.

This development, with its consequent increase in demand for fuel and electric power, offers Kentucky's coal industry an opportunity to recover some of the losses in production that have occurred in recent years as a result of competition from foreign residual oil and natural gas.

Kentucky's 3200 mines produced 44,865,000 tons of bituminous coal in 1953, according to statistics compiled by the National Coal Association.

Harbor for Taconite

Erie Mining Co. officials have announced the awarding of a contract to the Dravo Corp. of Pittsburgh, covering the construction of a breakwall, ore dock and harbor facilities at Taconite Harbor, Minn., 77 miles northeast of Duluth.

They also announced that a contract covering the grading, drainage, bridge and tunnel work of a railroad about 20 miles long from the Erie Mining Co.'s taconite processing plant near Aurora, Minn., to Taconite Harbor on the shore of Lake Superior has been awarded to a joint venture comprised of five contractors known as Arrowhead Constructors.

Both contracts are a part of Erie Mining Co.'s large-scale taconite project.

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Available in 3 to 12 tons: 42 to 48" high, 18 to 56½" track gauges.

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Lehigh Coal and Navigation Reorganizes

C. Millard Dodson was elected president of the Lehigh Coal and Navigation Co. at the reorganization meeting, May 3, of the company's Board of Managers. He succeeds Robert V. White who became chairman of the Board. H. Louis Thompson, formerly secretary and comptroller was elected vice-president and treasurer. F. M. Thayer, Jr. was elected secretary and Harry W. Siefert, who had been assistant comptroller was elected comptroller. W. E. Spatig succeeds Thayer as assistant secretary.



C. M. Dodson

In addition, W. J. Parton has been elected president of the Lehigh Navigation Coal Co. succeeding Glenn O. Kidd who resigned. Parton has been vice-president of the company since November 1953. He advanced to that office from general manager to which he was named in March 1951. Parton joined the company as a member of the Engineering Corps and shortly thereafter was named preparation engineer in charge of a research project of fine coal recovery methods. He was supervisor of flotation projects and production planning manager before being appointed superintendent of Nesquehoning Mine in 1947. In 1948 he became assistant to the general manager.



W. J. Parton



R. C. Newbold

Following the reorganization meeting of the Board of Managers of the Lehigh Coal and Navigation Co. the formation of the Lehigh Navigation Coal Sales Co. was announced. Richard C. Newbold is president of the new Sales Co. He had been vice-president in charge of sales for Lehigh Navigation Coal Co.

Increase Organization Efforts

According to the United Mine Workers, that organization has stepped up its activities to unionize Ohio's extensive non-union strip mines.

Taconite Town Gets Name

It's official now—the new post office address of Reserve Mining Co.'s "taconite town" on the north shore of Lake Superior, 55 miles from Duluth, is "Silver Bay, Minn." A post office with that name has been established and began operations May 1.

The name "Silver Bay" will be used by all persons telephoning, writing, or visiting either the new town or the construction site of Reserve's taconite processing plant. In the past, the address "Beaver Bay, Minn.," has been used because that post office served the new town and construction area. Silver Bay is located approximately four miles north of the incorporated village of Beaver Bay on Highway 61.

The new name announced by postal authorities was chosen for historical reasons. It has been used to designate Reserve's site for many years, particularly by fishermen, shippers, and government authorities dealing with the Great Lakes.

Dorr Establishes Fellowship

A fellowship for graduate study in the fields of metallurgical, chemical and sanitary engineering has been established by The Dorr Co., Engineers, of Stamford, Conn., to commemorate the golden jubilee of the invention by Dr. John Van Nostrand Dorr of the Dorr classifier, the base on which the Dorr Co. developed. The fields of the fellowships are those in which the principal interests of the company lie.

Appraise Coal Pipeline

Pittsburgh Consolidation Coal Co. has confirmed reports that independent engineers have been retained to assess costs of a commercial coal pipeline.

Joseph Pursglove, Jr., vice-president in charge of research and development, said: "We have engaged an engineering firm to appraise our cost estimates on building and operating a commercial pipeline system for transporting coal. These independent studies, which are now under way, are a preliminary step to our proceeding with the construction of such a system. Meanwhile, the company is continuing its efforts to establish commercial relations for the marketing of coal tonnages transported by pipeline."

The actual building of a commercial coal pipeline has not begun and no construction contracts for such a project have been placed.

Copper Contract

A contract designed to yield 12,000,000 lb of refined copper for delivery to the Government has been signed with the Vermont Copper Co., Inc., it has been announced by Edmund F. Mansure, administrator of General Services.

The agreement provides that the company will produce ore from its "high cost" Elizabeth Mine, located in Orange County, Vt., and will arrange with a qualified smelter to process the ore.

A. J. Walsh, commissioner of GSA's Emergency Procurement Service, who will administer the contract, said the Government will pay 31.06 cents per pound for deliveries made common carrier's conveyance, Connecticut Valley.

Terms of the agreement call for production of 4,000,000 lb in 1954, commencing July 1 of this year, and 8,000,000 lb in 1955. The agreement automatically ends December 31, 1955, or earlier if the full production has been achieved.

"The Government already has a contract with the company, signed in April, 1953, calling for the delivery of 8,000,000 lb of copper from the same mine by June 30, 1954," Walsh pointed out. "The price for this material was set at 32 cents per pound. When the current agreement expires, on June 30, 1954, the new contract will go into effect."

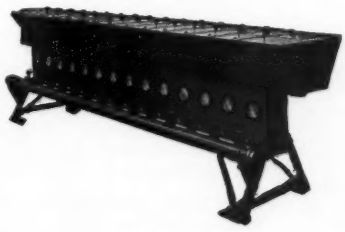


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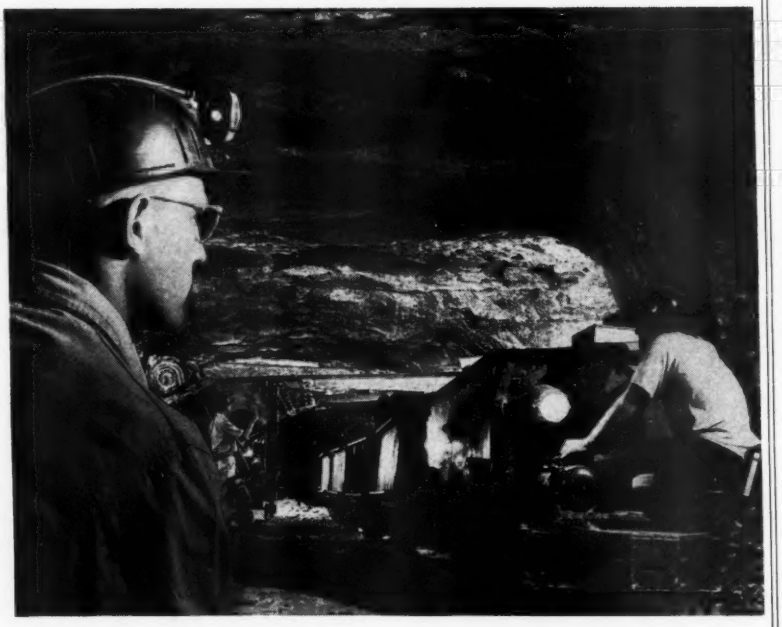
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Lithium Mining in North Carolina

A huge expansion of lithium mining in three counties of North Carolina is expected as a result of recent announcements of two big projects for the Cleveland-Gaston-Lincoln tricounty area. Foote Chemical Co., of Philadelphia, which has been operating in the area since 1951, began an expansion of its plant at Kings Mountain to produce lithium aluminum silicate.

Install Milling Unit

A 100-tpd milling unit has been placed in operation at the Roy Silver Mines, Ltd., in Cobalt, Ontario.

Development of ore has been reported on three levels down to 205 ft. A crosscut is now being run on a fourth level at about 300 ft.

Westmoreland Sinking Shaft

Westmoreland Coal Co. has started sinking the first of two shafts and a slope entrance at its Hampton Mines near Madison in Boone County, W. Va. The mine will tap approximately 10,000 acres of Cedar Grove coal in a region yet unmined, according to reports.

Eastern Gas and Fuel Associates' Shaft Department is sinking the shafts and slope under contract with Westmoreland. One shaft will be used for return air and the other for intake air. The slope, expected to be 850 to 900 ft long will serve as a manway and will be available for taking mine supplies underground.

Reserve Builds Homes

More than 300 new houses will be constructed in Silver Bay, Minn., this year, according to a spokesman for Reserve Mining Co., builders of the $160,000,000 project, which includes the huge taconite processing plant, two towns, 47-mile railroad, power plant, dock and harbor, and other facilities.

Also on the 1954 building program, scheduled to begin immediately, is a new temporary store, service station, sewer and water lines, paving sidewalks, curbs and gutters for this year's construction area.

Silver Bay now has 253 housing units completed and by November the total will be 564.

Earlier this year, Reserve announced it was building 242 homes during 1954 at its other taconite town, Babbitt, Minn. This will bring Babbitt's total to 371 by November.

Construction of Silver Bay's first 18-classroom elementary school, begun last fall, is proceeding on schedule and should be ready for use at the start of the 1954-55 school term. The brick exterior walls are completed and the roof is being erected. An identical school building is being built at Babbitt.

Now Penn-Texas Corp.

Stockholders of the Pennsylvania Coal & Coke Corp. have voted to change the corporation's name to the Penn-Texas Corp. Motivation for the change, according to L. D. Silberstein, president and board chairman, was that the firm had ceased to be merely a produced of bituminous coal. Through major acquisitions, it now has coal, shipping, oil and other interests.

Complete Degree Survey

The recognition committee of the Engineers Council for Professional Development, under the chairmanship of R. H. Barclay, has completed a survey of the awarding of the professional degree by various engineering institutions. The survey, with its excellent response—of the 146 institutions sent questionnaires 142 responded—will serve as a basis for formulating recommendations concerning the practice of awarding the professional degree as a means of professional recognition.

Of the engineering schools surveyed, 86 award the professional degree while 62 do not. Of the 86 awarding the degree, 74 use professional experience as a basis for awarding the degree, eight require resident graduate study and four include both professional experience and resident graduate study as prerequisites for awarding the professional degree.

In regard to their future plans concerning the professional degree, 69 colleges will continue awarding the degree, two will institute the professional degree, 13 will abandon it, 49 will continue not to award it, and 17 are uncertain as far as future plans are concerned. The survey shows that approximately one-fifth of the schools offering the professional degree have either dropped it or are making plans to do so.

The committee also reported an increase of approxiamtely 80 percent in the awarding of professional degrees in the last five years as compared with the previous five-year period. In the last 10 years, 1387 to 1398 professional degrees have been awarded, and of these, 917 to 922 have been awarded during the last five years.

The committee believes this survey to be the most comprehensive of its type ever undertaken and will use it in formulating recommendations on the practice which they believe should be followed in respect to awarding the professional degree as a means of professional recognition.

Move 100 Tons a Minute

A new, giant coal stripping shovel, believed to be the biggest land vehicle in the world, is now being built for the Hanna Coal Co. Division of Pittsburgh Consolidation Coal Co. by Marion Power Shovel Co., of Marion, Ohio.

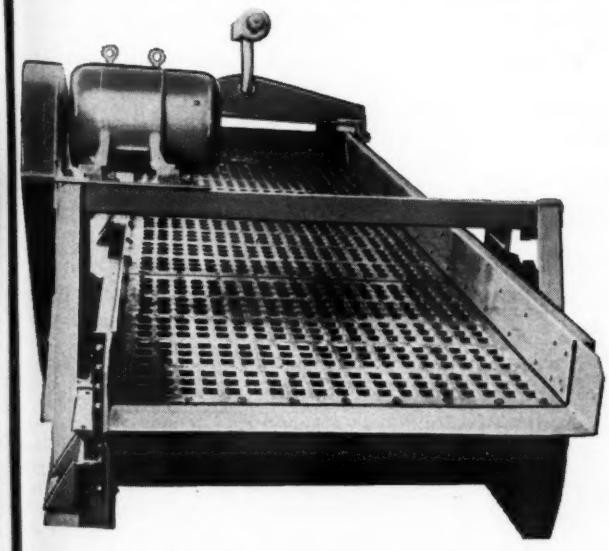
Hanna has ordered this machine to facilitate stripping overburden from coal seams that lie approximately 90 ft below the surface at its southeastern Ohio mines. While the bucket design is not yet frozen, its capacity may well be 60 cu yds, making it possible to move close to 100 tons of earth every 50 seconds.

The whole unit will be 50 percent larger than any existing equipment of its kind. Its total weight, 5,000,000 lb, will include 1,000,000 lb of ballast. Its height from the ground to the boom tip will be 145 ft, or as high as a 12-story building.

An office-building type elevator will be used to carry 1000 lb or three passengers up to the control section.

The giant shovel will be powered by 16 motors utilizing a total of 4500 hp. James Hyslop, president of Hanna Coal Co. Division, plans to place the $2,500,000 shovel into operation immediately after its completion, scheduled for late 1955.

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Purchases Norton Mine

C. E. Hough has purchased and is now operating the Norton mine, formerly owned and operated by West Virginia Coal & Coke Corp. Included in the purchase was the mining equipment, plant buildings and stores. The mine, which operates in the Kittanning seam, is located about ten miles west of Elkins, W. Va.

The West Virginia Coal & Coke Corp. will continue to market the entire output of the mine.

Can Now Own Part of Company

Coal miners and other employes of Armco Steel Corp. throughout the U. S. and in many countries are receiving information on a new plan which enables them to purchase company stock through payroll deductions. Armco operates coal mines in Raleigh and Boone Counties, W. Va.

The stock option plan for Armco employes was inaugurated January 30.

EGFA Sends Kids to Camp

The eighteenth consecutive season of summer recreation camps for the children of Eastern Gas and Fuel Associates coal mine and store workers opens in late June, according to Virgil M. Beckett, Pittsburgh, Eastern's director of welfare.

Camp Lightfoot is located near Hinton, W. Va., and is owned by Eastern Gas and Fuel Recreation Camps, Inc., a non-profit West Virginia corporation. Camp Washington-Carver near Beckley, W. Va., is leased from the West Virginia State Negro 4-H organization.

Upward of 1000 boys and girls from 13 communities in West Virginia and three in Pennsylvania will be enrolled in five two-week camping periods during which they will engage in athletic games, handcraft, swimming, nature study, camp craft, Indian lore, and other mind and body-building recreation.

Establish New Award

The American Institute of Mining and Metallurgical Engineers has announced acceptance of a fund from U. S. Steel Corp. for the establishment of the Benjamin F. Fairless Award to recognize distinguished achievement in iron and steel production and metallurgy. The Benjamin F. Fairless award, to be given annually, will honor the chairman of U. S. Steel for his intense interest in the technology and development of the iron and steel industry.

Committees are being appointed to work out the details necessary for the presentation of such an award and to select a recipient for the first Benjamin F. Fairless award to be presented at the annual banquet of the AIME on February 16, 1955, at the Conrad Hilton Hotel in Chicago.

There Is No Copper Shortage

Developments during the past two years have confirmed the belief that the much heralded copper shortage has no substance in fact, declared Richard C. Diehl, president of the Copper & Brass Research Association. In view of the publicity given to an anticipated shortage of copper during the Korean emergency and the official urge at that time to substitute other materials for copper, it is important to emphasize at this time, according to Diehl, that copper is in ample supply.

Temporary shortages that developed during the Korean episode were largely the result of dislocations induced by the various controls and restrictions imposed at the time. However, such transitory shortages as may have been experienced in certain industries during that period, should not have been made the basis for the erroneous assumption that copper would be in short supply indefinitely.

Diehl, who is also president of Chase Brass & Copper Co., Inc., emphasized that there is every prospect that copper will be plentiful for many years to come. Beginning in 1950 all of the leading copper producers initiated extensive programs for increasing mine production. The supply of copper from all sources increased in 1952 and again in 1953. Within two or three years the available supply if needed will exceed the present by at least 15 percent.

Safety Awards Announced

For heroic and timely action in saving lives, five workers in the Nation's mineral industries have been honored by awards from the Joseph A. Holmes Safety Association. The awards, including four medals of honor for individual heroism and one certificate of honor for using modern lifesaving methods in an emergency, were announced by J. J. Forbes, Director of the Bureau of Mines and president of the association, which is named after the first Director of the Bureau.

Medal of Honor winners were:

Sergt. Donald O. Love, USAF, 24, Walker Air Force Base, Roswell, N. M.

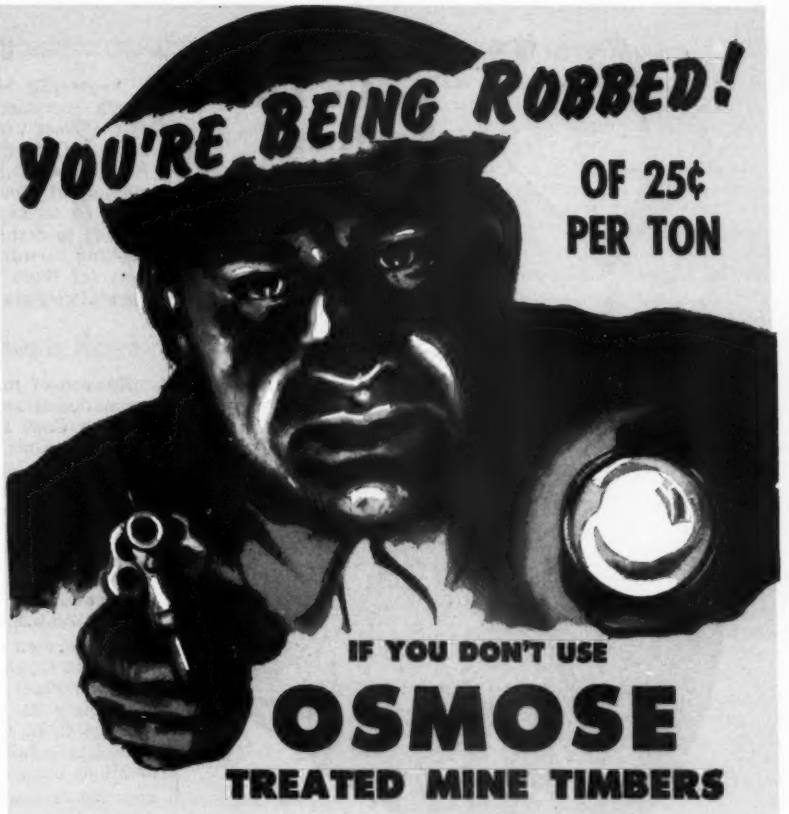
Ludwig Gulbranson, 54, Douglas Mining Co., Hibbing, Minn.

James Lopazanski, American Smelting and Refining Co., Perth Amboy Plant, Barber, N. J.

Elmer Pifer, 32, Pleasant Valley Coal Co., Frostburg, Md.

A certificate of honor was awarded to James Williamson, American Smelting and Refining Co., Perth Amboy Plant, Barber, N. J.

In addition, a certificate of honor was voted for Richard Mason, a reporter on the Beckley, W. Va., *Post-Herald*, for outstanding work in promoting interest in mine safety in southern West Virginia. Mason is a regular contributor to MINING CONGRESS JOURNAL.



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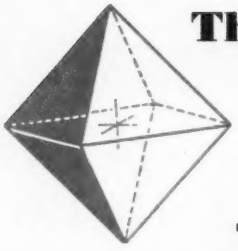
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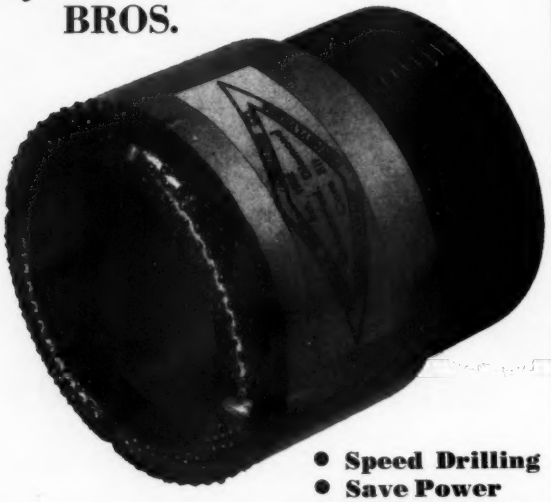
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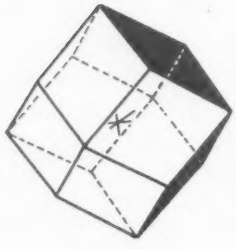
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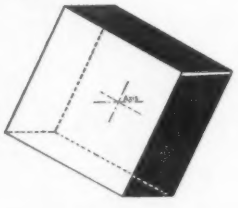


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Urge Revamping W. Va. Law

Appearing before the Pocahontas Operators Association's Operating Safety Committee, Frank B. King, chief of the West Virginia State Department of Mines, recently stated, "Our mining laws are becoming outmoded in part." Because of the high degree of mechanization and the introduction of more and more mechanical equipment, King went on to say, the mining seam has to be constantly studied to decide which are the best and safest practices. Looking forward, King said, "We hope to see the mining laws (of West Virginia) rewritten by the next session of the state legislature."

Survey Eastern Coast

Release of maps showing the location of radioactivity anomalies detected along parts of the Atlantic Ocean beach between Cape Fear, N. C., and Edisto Island, S. C., and along the Gulf of Mexico beach between Sanibel Island and Caladesi Island, Fla., was recently made by the U. S. Geological Survey which carried on the surveys. The anomalies represent areas of unusually high radioactivity as observed instrumentally from the air, and may or may not indicate the presence of uranium or thorium.

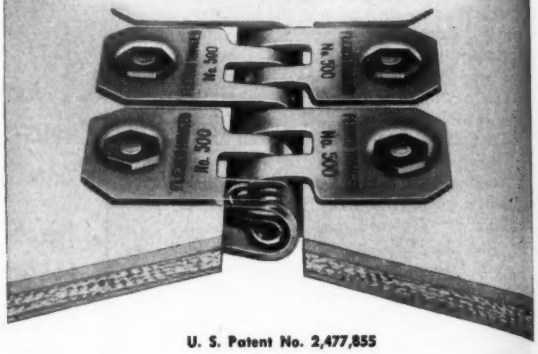
The surveys were a part of a program of airborne reconnaissance for radioactive deposits being conducted by the U.S.G.S. for the Atomic Energy Commission.

Maps are on public display at U.S.G.S offices in Washington, D. C., Denver and Grand Junction, Colo., Salt Lake City and Plant City, and Tallahassee, Fla. They are also on display at AEC offices in New York, Denver, Hot Springs, S. D., Grand Junction, Colo., Grants, N. M., Richfield, Utah, Salt Lake City, Butte, Mont. and the Bureau of Mines office at Rapid City, S. D.

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Look for Sulphur in Mexico

Texas International Sulphur Co. has begun core drilling for sulphur on its properties in the Isthmus of Tehuantepec, State of Veracruz, Mexico, near the sites where three other companies have already found high grade native sulphur in important commercial quantities, president Victor Dykes has announced.

One truck-mounted drilling rig is already in operation in the Isthmus, and a second truck-mounted rig will begin work shortly.

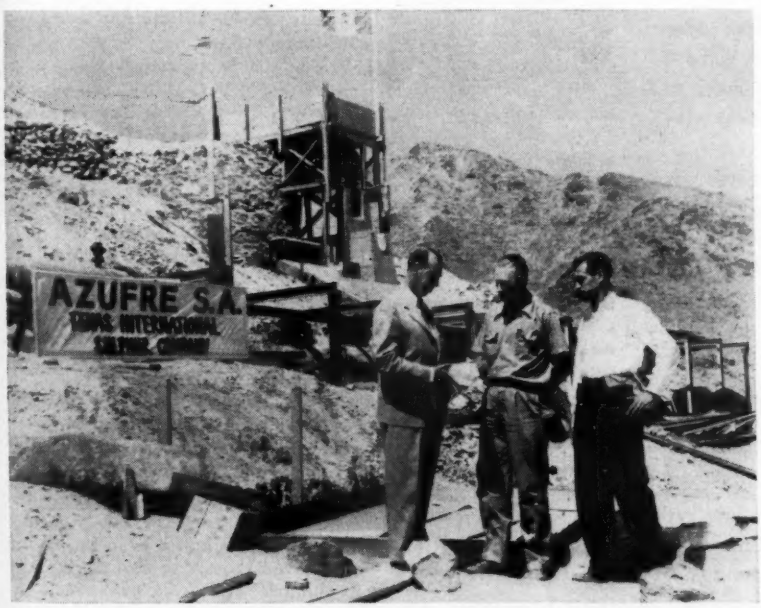
Texas International holds sulphur exploratory rights on 123,550 acres in Tehuantepec, 16,818 acres of which are yet to be selected.

The presence of salt structures on Texas International properties has been so well defined from surface indications that plans for seismographic exploration have been deferred pending the results obtained from the initial core drilling, Dykes reported.

The exploratory work is being done under the supervision of Salas and Dr. J. Brian Eby of Houston, the company's chief consultant geologist. Both geologists have expressed optimism over the results this new exploration will reveal as a result of geological surveys conducted by them.

The area to be explored is in an untamed, sparsely inhabited portion of Mexico some 250 miles southeast of Mexico City and adjacent to the Gulf of Mexico. The area includes dense jungle and marshland. There are some trails, but virtually no roads. Where roads are needed to move the drilling rigs and other equipment, they are being cut by bulldozer and native labor.

Dykes estimates it will take a minimum of four months to cover the known structures in the area to be explored.



Victor Dykes, left, president of Texas International Sulphur Co., receives from J. H. Pollard, the company's chief engineer, the first slab of pure sulphur processed at Texas International Sulphur Co.'s new plant at San Felipe, Baja California, Mexico. At right is Joaquin Noriega, plant administrative manager. Production from the TIS plant 125 miles from the border provide the U. S. West Coast with a nearby source of sulphur. Initial production will be at the rate of 700 tons per month, but the plant has been designed for double that capacity.

Idaho Safety Winners

Four Idaho mines received awards in a mine safety contest sponsored by the Idaho Department of Mines. The recipients were:

Bunker Hill & Sullivan for the best safety record in a mine working more than 250,000 man-hours in 1953.

Page mine for the most improvement in its safety record over 1952 for mines working more than 250,000 man-hours.

Clayton Silver for the best record for mines working from 25,000 to 250,000 man-hours.

And Highland - Surprise Consolidated for the most improvement over 1952 safety record for mines working 25,000 to 250,000 man-hours.

Honor W. L. Zeigler

At commencement exercises June 6, the University of Idaho awarded W. L. Zeigler an honorary doctor of science degree. Zeigler, formerly mill superintendent for the Hecla Mining Co., in now general manager of the Pend Oreille Mines & Metals Co. at Metaline Falls, Wash. He is a University of Idaho graduate, receiving a degree in mining engineering in 1910 and has established a worldwide reputation in milling technology.

Copper Creek Working

The Copper Creek Consolidated Mining Co. is operating its milling plant on a three-shift basis, treating ore from the Old Reliable mine, located in the Copper Creek area of Pinal County, northeast of Mammoth, Ariz. The Copper Creek organization originally planned a leaching-in-place operation, but current production is from previously developed ore which is high enough in copper content to mill by conventional methods. M. J. Elsing of Tucson, Ariz., is president and general manager of the company.

Ore Shipments Scheduled

Stoping and shipping of high-grade silver-gold ore is scheduled by Summit King Mines, Ltd., at its Summit King mine north of Tonopah, Nev., according to Percy Dodson, manager. Summit King has conducted an extensive exploration and development program at its mine during the last year. Since diamond drilling encountered mineralization, an underground development program of sinking, crosscutting and drifting to a depth of 550 ft has blocked out considerable ore.

First stoping will be above the 550-ft level while a new 425-ft level will be developed by crosscutting from the winze. Stoping above the 300-ft level is also planned. This is the first level developed and has higher than mine-grade ore developed for mining.

The tough ones come to Card



How HOMESTAKE solved two HAULAGE PROBLEMS

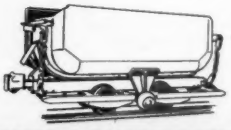
When Homestake Mining Company needed larger haulage capacity, Card engineers were called in. At Homestake, ore cars are automatically dumped while in motion, and haulage ways are limited in cross section. So, special Granby-type cars were chosen to replace the old gable-bottom cars.

Since 1939, 390 of these special Card cars have gone to Homestake on eight successive orders. Designed for maximum capacity, they have only a very minimum of side clearance. They are fabricated wholly of Cor-Ten plate and hold 60 cu. ft. Greatest design change over the years has been to a heavier liner plate to allow loading without the degree of ore fragmentation originally planned. Originally the cars were loaded through 14" grizzlies. Now they are loaded with the largest sizes that will clear the chutes.

Card has recently furnished 61 special Rocker Dump cars for development work at Homestake. These are well suited to handling waste and dumping in old stopes.

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DENVER, COLORADO

Chase Mine Sold

The Chase mine of the Rocky Mountain Mines has been acquired under lease and option by H. W. Gould and Co., 1100 Mills Tower, San Francisco 4, Calif. The property consists of five patented and five unpatented claims, plus two fractions, and is located 13 miles southeast of Prescott, Ariz. Ore values are in copper, lead, zinc, gold, and silver. Some test shipments are being trucked to the Iron King mill at Humboldt, until further development justifies mill erection at the mine. D. L. Nevens, Box 1622, Prescott, is mine foreman. Malcolm B. Gould of San Francisco is directing the exploration program.

Contract to Mill Montana Ores

Contract Milling Co., recently incorporated in Spokane, has a two-year contract with a Washington State firm operating in Montana to mill its gold, silver and manganese ores, according to J. Stanley Huckaba, one of the incorporators. Work will be done at Butte, Mont., for the Mitchell Mining Co., Mount Vernon, Wash.

Huckaba said his firm is offering a new service in mining and investigated its feasibility carefully before undertaking the venture. Standard equipment will be used, but it will be so arranged that it can be moved with a minimum of dismantling.

N. M. Miners Move

Offices of the New Mexico Mining Association are now located in Santa Fe, N. M. The new location is the Laughlin Building at the corner of San Francisco and Don Gasper Streets, Santa Fe. All mail should be addressed to C. H. Murphey, Executive Director, New Mexico Mining Association, P. O. Box 1125, Santa Fe, N. M.

Uranium Ore Sampling

Uranium ore-sampling techniques at the major ore-buying stations throughout the Colorado Plateau have reached a high degree of efficiency, with uniform accuracy and with possibility of error reduced to a practical minimum, according to the Grand Junction Operations Office of the U. S. Atomic Energy Commission at Grand Junction, Colo.

Basing the statement on the results of a careful check on sampling plants by the AEC during the past 16 months, the announcement revealed that comparisons of assays made on the same truck loads of ore sampled at the various buying stations and also at an AEC check station revealed only variations that were well within analytical tolerances.

1954 Mining Show

State and District Chairmen Meet to Draft Program for San Francisco Meeting

STATE and District Chairmen of the Program Committee for the American Mining Congress 1954 Metal and Nonmetallic Mining Convention and Exposition next September, are meeting this month in San Francisco to map out plans for the meeting.

Ever since the appointment of the nation-wide program committee, led by Frank R. Milliken, vice-president of Kennecott Copper Corp., suggestions for the program have been pouring into the Washington office of the MINING CONGRESS. These have been correlated into an agenda for the consideration of the chairmen and from them a program will be formulated.

Judging from advance indications, an even more comprehensive program than in the past will be required to do justice to the problems, general economic and operating, that are engaging the attention of mining men throughout the nation. Literally hundreds of suggestions are awaiting consideration by those who attend this early summer meeting.

The Program Committee will ask prominent legislators, leaders in Government and foremost industry spokesmen to adress the September meeting on national issues. Also practical mining men will relate their experiences in applying new tools and methods to the task of turning out the metals and minerals needed to maintain America's place as the leader of the industrial nations of the earth. Of particular interest will be a series of sessions dealing with the booming production of uranium on which the eyes of the mining world and the country at large are focused today.

American Mining Congress meetings provide a forum wherein practical mining men can exchange ideas and information with the freedom necessary for the advancement of the art and science of mining. So valuable have the discussions at these conventions become that progressive mining executives are going all out to send considerable numbers of their key men—superintendents, engineers, geologists and others responsible for daily operation and maintenance of our mineral industry, to these meetings. Active participation in the various sessions, the wide contact with other up-and-coming mining men and the opportunity to see all the latest in mining and milling equipment pay off in better employe relations, renewed enthusiasm and new ideas for doing a better job.

Show Nearly Sold Out

This year's Exposition will be the largest ever held. The entire space in San Francisco's large auditorium plus most of the adjacent outside area has already been reserved by more than 140 leading manufacturers and suppliers to the mineral industry. Featured at this Mining Show will be all the latest developments in machinery, equipment and supplies for underground and open pit mining and mineral treatment. Each exhibitor will have on hand a team of crack representatives, ready and willing to discuss with visiting mining men every problem relating to use of the equipment on hand and to offer suggestions for the solution of the problems of day to day operations. No mining man can afford to miss this vast collection of mining and milling machinery of all types. Here is a chance to learn at first hand all about the very latest in equipment and supplies.

Committees at Work

Planning for a successful convention requires a lot of detailed work by well organized and ably directed committees. Co-chairmen of the General Committee are Donald H. McLaughlin, president of Homestake Mining Co., and Worthen Bradley, president of Bradley Mining Co., both of San Francisco. Vice Chairmen are Albert F. Knorp, secretary of the AMC California chapter, and Granville S. Borden, vice-president, Idaho-Maryland Mines Corp. S. H. Williston, vice-president, Cordero Mining Co., and Philip R. Bradley, Jr., president, Pacific Mining Co. are Co-Chairmen of the Publicity and Attendance Committee. Heading up the Welcoming Committee, are L. T. Kett, general manager of Mountain Copper Co., Ltd., and Jack H. How, president, Western Machinery Co. H. A. Sawin, Yuba Manufacturing Co., and Max F. Holsinger, general manager of Mining World, are Co-Chairmen of the Trips Committee. Mrs. Frank Girard is Honorary Chairman of the Ladies' Committee and Mrs. Philip R. Bradley, Jr., is its Chairman.

Trips Planned

Following the four days of the Show, convention visitors will have a choice of a day of salmon fishing in the Pacific ocean, where a fleet of 28 fishing boats, each with room for six to 12 persons, have been made available for the 1954 Salmon Derby. Special prizes will be awarded for the biggest catch. As an alternate for those not interested in fishing or who doubt their sea-legs, there will be an inspection trip to the gold-dredging operations along the Yuba river. Special trips may also be arranged to industrial operations in the San Francisco Bay area.

By special arrangements, also the AIME Minerals Beneficiation Division is planning to hold its fall meeting in San Francisco on Friday, September 24, immediately following the four days of the big Mining Show. The program for this event is being handled by Will Mitchell, Jr., research department, Allis-Chalmers Manufacturing Co. and his committee. The program the MBD is planning will have a "distinct western flavor," and will supplement the milling and metallurgical sessions at the Mining Congress convention during the previous days of the week.

Make Reservations Now

A record turn-out is expected for this, the big mining event of the year. San Francisco is well able to take care of all visitors, but those who plan to attend and have not yet requested accommodations are urged to do so promptly. Hotel reservations are being handled by the Housing Bureau, operated by the San Francisco Convention and Visitors Bureau, Room 300, 61 Grove St., San Francisco 2, Calif.

The metal and nonmetallic mining convention and exposition on September 20-24 with its many attractions will be the outstanding mining event of the year. Plan now to be there.

Scheelite In Gold Mines

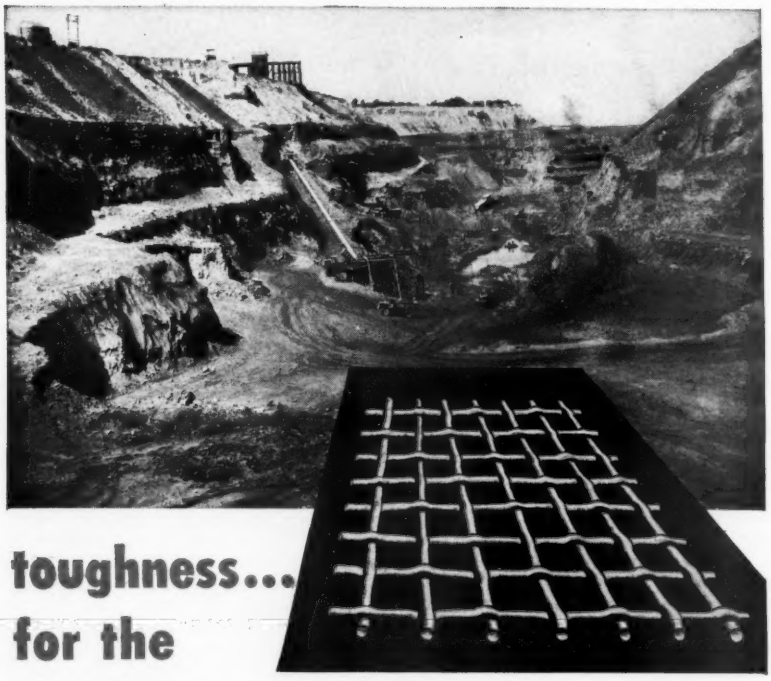
The Idaho-Maryland Mines Corp. has reported that their gold mines at Grass Valley, Calif. contain a number of high grade tungsten deposits. The ore is primarily scheelite. The extent of the deposits is not yet know but assays indicate commercial ore.

Colorado Locals Bolt MMSW

By a 59 to 4 vote, 20 members abstaining, the Gilman local of the International Union of Mine, Mill and Smelter Workers recently voted to withdraw from the union and seek a charter with the CIO United Steel Workers.

This action was followed shortly by the bolting of another Colorado local from the Mine, Mill and Smelter Workers. Members of Salida Local 916, all employes of the Reynolds Mining Co. in Salida, Colo., voted unanimously to leave Mine-Mill and instructed their officers to ask United Steelworkers, CIO for a local chapter.

These two actions left Mine-Mill with only three locals in Colorado, two in Leadville and one in Denver.



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South Dakota Manganese Find

Deposits of iron ore mixed with manganese have been discovered near Pierre, S. D., according to the South Dakota Natural Resources Commission. They could mean the basis of mining operations there. The Chicago and Northwestern Railroad is reported interested in the deposit and new processes for extracting low quality ores might help this development.

Golconda Exploration

Golconda Lead Mines has begun diamond drilling at its mine east of Wallace, Idaho, in an attempt to intersect ore bodies mined on higher levels. Work now has been pushed some 1600 ft from the 1800-ft level shaft station and is also being done east of the 1150 winze level.

Set Safety Record

Employes of the Keigley limestone quarry, operated by Columbia-Geneva Steel Division, United States Steel Corp., near Payson, Utah, have racked up a remarkable record of 1000 days—270,000 man hours—without a single lost-time accident.

Acquire Uranium Claims

Floyd B. Odlum, president of Atlas Corp., has announced the acquisition, in behalf of corporate interests represented by him, of a group of uranium mining claims and options in the Big Indian district of San Juan County, Utah.

The claims and options were purchased in part from Charles A. Steen and were acquired on behalf of Wasatch Corp., an Atlas subsidiary, and for San Diego Corp. and Airfleets, Inc., in both of which companies Atlas has minority stock interest.

At the same time, Odlum announced that an agreement had been made to combine certain of the claims and options owned by Wasatch, San Diego and Airfleets with the uranium properties of the Lisbon Uranium Corp. of Salt Lake City. Lisbon Uranium owns a group of 10 claims in the same area. Other claims and options are being retained by the three companies, Odlum said.

Both groups of properties involved in the combination are in the Big Indian district and are located midway between Mi Vida mine discovered by Charles Steen and the LaSalle Mining Co. properties recently acquired by Homestake Mining Co. Some of the Odlum property adjoins those of Lisbon Uranium Corp. while others are in the immediate vicinity. The Odlum-Lisbon properties are a mile northwest of the Mi Vida mines and 1½ miles southeast of the Homestake properties.

Lease Colorado Coal Land

The Colorado Land Board has signed a 25-year contract with Utah Construction Co. to lease 10,000 acres of coal in Moffat County, Colo. This is the first major lease signed by the State for several years.

Idaho Claims Purchased

Western Mining Corp., Boise, Idaho, has purchased the Gallatin and Hyalite Canyon vermiculite and calcite claims near Bozeman, Mont., from Roy Walton of Bozeman. The Idaho mining concern announced that a plant to manufacture insulation and light weight aggregates for concrete and plaster would be constructed at Nampa, Idaho. Vermiculite ore from Bozeman will be shipped to Nampa for processing.

Utah Public Lands Withdrawn

The Grand Junction Operations Office of the U. S. Atomic Energy Commission has announced that additional lands in Utah have been segregated from the public domain for utilization in the commission's domestic uranium program to keep uranium production on the Colorado plateau at the maximum. The lands affected are in Garfield County, Utah.

Will Reopen Gold Mine

Plans are being made by the Argus Development Co., to reopen the Ruth gold mine, 10 mi. north of Trona, Calif. Developed in 1937 by Burton Bros., Inc., of Rosamond, Calif., the mine was closed down in 1942 by the War Production Board, according to officials of the newly-formed company.

There is a 300-ton mill on the property as well as warehouses, assay office, blacksmith shop and 15 dwellings. Argus plans to rehabilitate the mill by replacing the crushers removed during the war and the diesel power plant.

To Mill Nevada Tungsten

Alpine Mining Co. is assembling machinery and equipment at its Nevada tungsten property preparatory to mill construction, according to a company spokesman. The property is located just south of Ely, Nev.

Pittston Co. in Uranium

The Red Bluff uranium mine, a group of 13 claims, has been sold by Mr. and Mrs. Carl Larsen of Globe, Ariz. to the Pittston Co.

The Pittston Co., J. Stinson Young, vice-president, is primarily a holding company interested in coal and coal mines and the distribution of fuel and diesel oils in the metropolitan New York area.

At present 8 or 10 men are at work at the Red Bluff. Ore mined during preliminary development is being stockpiled. Most of the work so far has been done with hand equipment, but Young plans to send in bulldozers, compressors, loaders and deep mining equipment immediately to speed operations. A portion of the orebody probably will be stripped, with the remainder being mined by underground methods. A goal of 1000 tons of uranium ore monthly has been set.

The Red Bluff discovery was made by the Larsens in 1950. The uranium occurs in silty quartzite of the pre-Cambrian Apache group as a finely disseminated deposit, and considerable difficulty was experienced in identifying the primary uranium mineral. Approximately 500 tons of ore were shipped to the AEC by the Larsens. The mine is located in the Sierra Ancha region, 34 miles northwest of Globe.

To Interest American Youth

Colorado Mining Corp. of New York has launched a nation-wide program designed to alleviate the shortage of young mining engineers. Called "Mining Engineering for American Youth," the program will take a boy from one of America's high schools—preferably one with no prior interest in mining—and send him to Colorado to find out what metal and coal mining are all about.

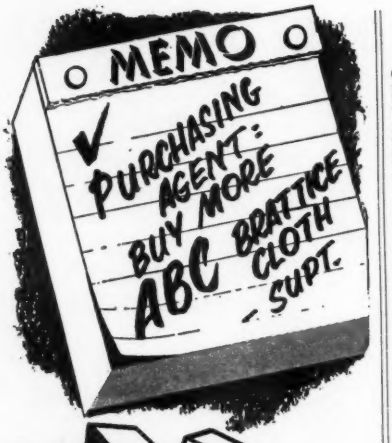
During a four-week stay at the corporation's claims in the Hahn's Peak mining district in Routt County, Colo., his progress will be reported periodically to high schools throughout the nation. If his experience during this month leads him to elect mining engineering as his life's career, he may receive a scholarship from the company at a school of his own choosing.

His expenses will be paid and he'll receive a $50-a-week salary, plus room and board, clothing, mining gear and fishing tackle. He will also be allowed to keep the proceeds from whatever ore he is able to haul from the mine's "dump" in a truck which will be furnished him.

The lucky students will be selected in various towns by high school authorities and sponsoring groups such as the Rotary Club and PTA. Boys may qualify by showing no specific interest in mining as a career and by submitting outstanding marks in mathematics and science subjects.

In addition to learning about copper and molybdenum mining at Hahn's Peak, the young man will spend some time at the nearby Mount Harris coal mine. His work at both places will be supervised by mining engineers, and there will be plenty of time for hunting and fishing if he feels so inclined. All his out-of-pocket expenses, including transportation both ways, will be paid.

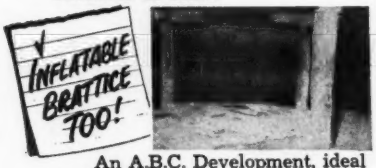




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Idaho Consol Improvements

Idaho Consolidated Mines, Inc., has completed construction of a new mill building at its Twin Peaks mine, a lead-copper-silver property in Lemhi County, Idaho. Equipment is now being installed for operation sometime this spring.

Underground, according to reports, the mine is in good shape to supply plenty of ore to keep the mill going at a rate of 125 to 150 tpd, once it is tuned up. Seven draw-points for ore have reportedly been opened up and four have chutes installed.

A compressor house at the main portal has been completed and now houses a 315-cu ft compressor and an electric generator for lights, ventilation, battery charging and other purposes.

Strike New Ore Lode

George W. Snyder, Sr., president of the Bristol Silver Mines, Inc., reports leasers at the company's mine in the Jack Rabbit district near Pioche, Nev., have hit a 12-ft face of lead-silver-copper-zinc ore on a southeast drift on the 1,000-ft level.

Buy Alaskan Copper Property

Alaska Copper Mining Co., Inc., has purchased claim rights to a copper mine in the McLaren River region of Alaska. John Pettyjohn, Alaskan prospector, made the find last year. Pettyjohn began his search for copper in the McLaren River region in 1951 after hearing tales from an old time prospector that there was copper in the area. Last July he discovered a number of veins in the side of a deep gulch over 4000 ft high.

More Aluminum

The Aluminum Co. of America's new four-potline Rockdale Works, which adds 90,000 tons annually to the nation's expanding aluminum-smelting capacity, was formally dedicated April 24 and is currently in operation.

The Rockdale Works is the first aluminum smelting plant in history to use electric power generated by burning lignite as fuel for firing steam turbogenerators.

Power for Rockdale operations is being provided by the Sandow Power Plant, adjacent to the smelting facilities. This power plant is owned by Alcoa, but is operated by the Industrial Generating Co., an affiliate of Texas Power and Light Co. The lignite deposits are close to the power facilities.

The Milam County, Tex., lignite used in the Sandow Power Plant has high moisture content and must be dried by a special process before burning. It is hoped that eventually it will be possible to obtain tars of commercial value from the lignite before it is used for fuel, by means of a low-temperature carbonization process.

Pilot operations in connection with lignite carbonization are now being conducted at Rockdale. The lignite drying and carbonization methods are known as the Parry Process.

Initially, the power-generating facilities are being supplied with dried lignite, rather than lignite "char" which is the end-product fuel after carbonization.

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Wheels of Government

(*Continued from page* 86)

ropean nations to remove tariff barriers against U. S. coal.

The industry also urged the Government to reexamine the need for importing natural gas from Canada, and questioned Government financial aid to European coal-producing nations for improving their production facilities.

Following on the heels of this meeting, representatives of the industry met in Chicago and set up a formal organization and created a number of subcommittees to work on specific phases of the program.

Stockpiling Hearing

On May 21, a House Interior Subcommittee conducted a searching inquiry into Administration plans for increasing stockpiling objectives and reasons for the delay in putting such plans into effect. The President had announced in mid-March that he had requested the Office of Defense Mobilization to review the stockpile goals with a view to increasing them to aid domestic mines.

Appearing before the committee, behind closed doors, were Assistant Secretary of Interior Felix Wormser, ODM Director Arthur Flemming, and GSA Administrator Edward Mansure.

Reliable reports indicate that they were closely questioned as to what progress had been made in setting new goals and establishing new purchase programs. The answers seem to have been in generalities, with no concrete information given as to what metals or minerals would be purchased, nor as to terms of contracts. The committee was told, however, that since the lead and zinc industries were suffering serious reverses at this time it was likely that the first program would be aimed at helping those domestic industries.

Oil Shale

(*Continued from page* 76)

Use Diesel Trucks

Transportation of the broken oil shale to the stock pile or the crushing plant is done in diesel-powered rear dump trucks. Truck bodies must be extremely rugged because the rock is coarse, sharp and tough and damages light dump trucks severely. Truck capacity must be in balance with the shovel dipper size and with the haul distance. The 22-ton truck probably is in best balance with the three-yd shovel that is used for loading.

Underground Quarry Bench

When operations stabilize nearly half the tonnage will come from the underground quarry bench. On the bench, drilling will probably be by down holes. These down holes have been drilled both by percussion drills mounted on wagon drill sashes attached to crawler type tractors, and by an experimental rotary drill which is being developed by the Bureau at Rifle. Because of the two free faces available for bench drilling and blasting, bench drill holes are spaced further apart than those of the heading round. Consequently, a higher tons-per-man-shift ratio is achieved when drilling and blasting the bench. The loading and transportation operations are very similar except that larger rounds can be broken on the bench and the shovel need not be moved as often when loading from the bench as when loading from the heading.

150 Tons per Man Shift

In the mining system just described for the heading, two men are used to drill, one man to operate the compressor, two men to scale, two men to charge the holes, one man to clean up, one man to wet down broken rock piles and roadway, one man to load, and three men to drive the trucks. One foreman serves to keep the operation going smoothly. In this manner 14 men underground mine 2000 to 2400 tons per shift, or about 150 tons per man shift. Mining the bench as an underground quarry will result in an even higher tons per man shift ratio. Outside men needed for an operation of this sort are maintenance and repair mechanics and electricians, explosives and warehouse men, engineers and supervisors. Calculations indicate that in a commercial type operation having five units operating on each shift, to yield roughly 12,000 tons a shift or 36,000 tons a day, the output of all men working in the mine or assigned to the mine payroll will be about 120 tons per man shift.

Low Mining Cost

The cost of mining oil shale at the value of the 1954 dollars and using the method described, will probably be less than 50 cents a ton, over-all, with direct costs approximately 25 cents a ton. The research in mining is continuing at the Bureau and new and improved techniques which will result in lower costs are being developed. One of these of particular interest to the entire mining industry is the development of a rotary drill for strong rocks.

Processing

The processing of the oil shale consists of crushing the run-of-mine oil shale, retorting the crushed oil shale, and refining the shale oil. These steps will be described in detail in an early issue.

Resume Exploration Operation

Grandview Mines has resumed diamond drilling exploration at its Dosser-Maki-Lotz holdings in Stevens County, Wash. Drilling was interrupted late last fall by snow and cold weather. Work is being carried on under an exploration contract with the Defense Minerals Exploration Administration.

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Drilling Contract Let

Sprague & Henwood, Inc., has recently been awarded two separate contracts by the United States Geological Survey, Denver, Colo., for diamond drilling in the uranium fields of the Colorado Plateau Area.

One contract covered an extension of exploratory drilling at La Sal Creek Area No. 2, Montrose County, Colo., and San Juan County, Utah, totalling 60,000 lin ft. The other contract, also for 60,000 ft is for additional exploratory drilling on the Gateway No. 2 (Beaver Mesa Area) Project in Mesa County, Colo., and Grand County, Utah.

Vindicator Shaft Progress

The 100-ft level in the shaft of the Vindicator Silver-Lead property east of Mullan, Idaho was passed in early May, with progress averaging about four ft per day. Three shafts a day are being used on the three-compartment shaft which will be sunk to the 800 level.

Using New Drill

Calaveras Cement Co. has placed a new 54-ton Bucyrus-Erie Rotary Drill into operation at its San Andreas (Calif.) plant. Company president William Wallace Mein, Jr., announced that Calaveras is pioneering in the use of the drill both in the cement industry and in the West. The drill will be used in the cement company's quarry for drilling primary blast holes to depths of 90 ft or less. A 9⅞-in. blast hole will be drilled.

Red Canon Mine Sold

Purchase of the Red Canon mine property and equipment by Lyndon Fogg of Cedaredge, Colo., has been announced. The Red Canon, located north of Cedaredge, has been operated by Lloyd Patton and Sons, who have had the coal property for almost 50 years. Lester L. Patton plans to continue to sell coal from the mine through his outlets in Montrose and Delta, Colo. Fogg said he planned to construct a new tipple and shaker screening plant in front of the new haulage tunnel now being completed. Operation of the mine will be continued on the same basis and with the same crew.

Extend Gubser Tunnel

Sunny Peak Mining Co. is extending its Gubser tunnel located ½ mile north of Conconully, Wash. The 800-ft adit will be extended to intersect a vein which yielded silver-lead-copper ore near the surface many years ago.

New access road has been built to the tunnel and an air compressor and other mining equipment installed.

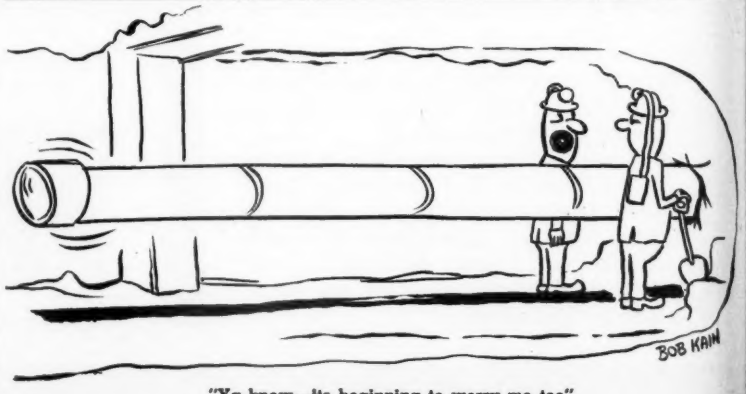
Climax the New Champ

The molybdenum mine at Climax, Colo., is now the largest underground mine in North America, according to Arthur H. Bunker, president of the Climax Molybdenum Co. Production at the Climax mine reached the rate of 27,000 tpd of molybdenum ore in late January. The previous record holder was the Robena coal mine of the U. S. Steel Corporation in Greene County, Pa. It held the title for more than six years with a daily production rate of over 20,000 tons.

Filtrol To Buy Eureka Clay

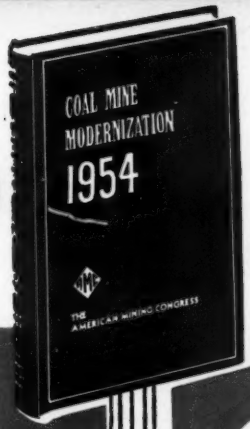
Filtrol Corp. has entered into a deal to buy a halloysite clay deposit in the Eureka mining district of Utah from the Dragon Consolidated Mines Co. Dragon Consolidated is an affiliate of International Smelting and Refining Co., a wholly owned subsidiary of Anaconda Copper Mining Co.

The transaction has been unanimously approved by Dragon stockholders. The Dragon stockholders also have been informed that Filtrol will undertake the mining and development of the clay deposit.



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Sinclair Resumes Oil Shale Study

Experimental work in recovering oil from shale beds without mining is being resumed in the oil shale fields northeast of DeBeque, Colo., by the Sinclair Oil Co. Operations at the experimental plant are expected to begin shortly. Personnel have arrived at the plant from Tulsa, Okla., to reopen the plant. In the experimental process, the shale is drilled and heat applied to extract the oil from the beds without mining. Results of experiments last summer with this method were reported as encouraging.

Whitedelf Intersects Ore

Whitedelf Mining and Development Co. has intersected a vein of high-grade silver-lead ore south of the shaft of the new 800-ft level at its mine near Clark Fork, Idaho, according to reports. The new structure was cut in the south crosscut and is believed to be a downward extension of an ore shoot mined on the 400 level.

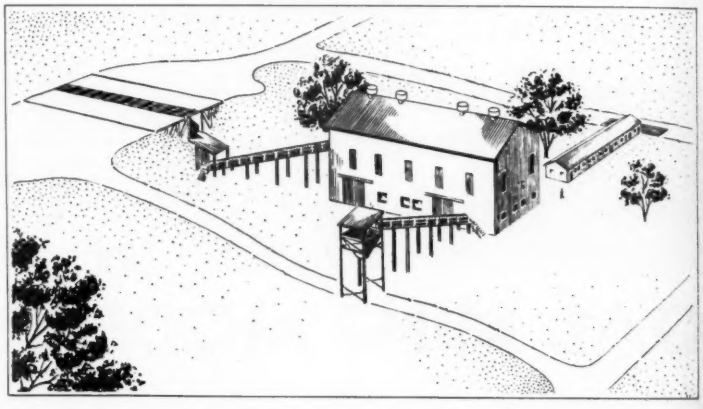
Previous recent ore discoveries on the new deep level had been in the area north of the shaft where stopping is now in progress.

Magnesite Firm Reopens

Operations of the Northwest Magnesite Co. have been resumed, Howard Ziebell, general manager, recently announced. The concern, whose parent company is located in Pittsburgh, Pa., had suspended all operations because of lessened steel activity in the eastern and southern sections of the country.

Improved steel production prompted the opening of the facilities at Chewalah, Wash. During the shutdown facilities were remodeled, an automatic loader was installed on the Finch tramway, the traction rope on the tramway replaced and grinding capacity at the Finch quarry was doubled.

Sampling Plant For Moab



Sheldon P. Wimpfen, manager of the Grand Junction Operations Office, U. S. Atomic Energy Commission, announced that a "Notice to Bidders" has been issued in connection with the construction of a crushing and sampling plant at Moab, Utah.

It is expected that construction will commence in the immediate future and that the facility will be ready for operation in September or October of this year. The sampling plant will be one of the largest uranium ore receiving stations in the Colorado Plateau and will incorporate mechanical sampling equipment and procedures to obtain accurate ore samples.

This new buying station at Moab, Utah, will provide a convenient market for acceptable uranium ores being produced in the Moab area which are not amenable to the Monticello plant process and the Commission anticipates it will encourage private industry in the search for new ore deposits in eastern Utah. Provisions under which ores will be acceptable at the new sampling plant will be announced at the time the station is ready to receive shipments or an earlier date if at all possible.

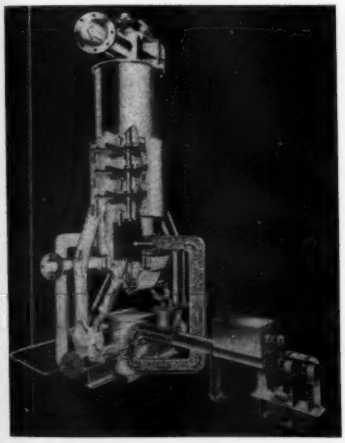
Truck scales and ore receiving and stockpilling facilities are now being placed on the plant site and arrangements are being made to accept limited tonnages of ores on a provisional basis. Purchases on a provisional basis will be made only under individual contracts with sellers whereby partial payment will be made on the basis of a provisional sample with final payment to be made at a later date on the basis of final sampling in the new sampling plant. It is expected that the buying depot will be ready to receive acceptable ores on a provisional basis and under special contract early in May of this year. The American Smelting and Refining Co. will operate the new facility as ore buying agent for the Commission.

Manufacturers Forum

Pulverizing Machine

An improvement in the design of its jet pulverizing machines has been announced by Majac, Inc., 23rd St. at P.R.R., Sharpsburg, Pa. The new design incorporates a "rock stripper" phase which removes foreign particles of great specific gravity immediately after material to be pulverized is introduced into the machine. By eliminating this foreign material quickly, the entire pulverizing process is accelerated according to the maker.

Majac Jet pulverizers function by creating head-on collisions of materials against themselves under high



velocity, attained by injecting materials through opposing guns by means of high pressure gas jets. It is claimed that the system provides an efficient, fast pulverizing action with a minimum of moving parts and a consequent saving in power and replacement costs. Solid fuels, the company reports, can be economically pulverized to a fineness of more than 90 percent through a 200-mesh screen.

The equipment is suitable for reduction of a wide range of chemicals and minerals including limestone, iron ore, clays, graphite, feldspar, alumina, Vermiculite, insecticides, fungicides, paint pigments, etc., and is also used for expoliation of fibrous materials such as wood pulp, asbestos and mica. The manufacturer will furnish literature, together with a list of more than 50 materials which the machine has successfully processed, upon request.

Tell of New Vibrating Conveyor

A new and smaller vibrating conveyor has been developed by Hewitt-Robins Incorporated.

The unit, mounted on springs, is designed to convey at a speed of 38 fpm such diversified materials as grain, bundled newspapers, metal scrap, chemicals, coal, sand and gravel, wood chips, beans, and flue dust. Pans with special coating or of stainless steel are available to make it suitable for handling extremely corrosive and abrasive materials.

The conveyor can be set up or moved in less than an hour, according to the manufacturer.

Standard pans are four-in. deep and can be supplied in widths of 8, 12, or 18 in. with or without top covers. The single-drive, one-hp model is available in lengths ranging from 20 ft to 100 ft, and transfer sections can be used to couple two or more units in tandem.

Nuts That Hold

A new, radically different locknut has been announced by Morse Products Development Co., Los Angeles, Calif. Principle of the new fastener is that of attaining a designed tightening load on the bolt without the use of a torque wrench and maintaining this load under a spring pressure so that any change in the bolted assembly is compensated by the spring retension. Under these conditions, according to the announcement, the bolted assembly cannot vibrate loose.

The new item, called Morse "Hi-Load" Spring Locknut consists of a two-part unit. A usual nut with a conical lower end that mates with a hardened steel washer to form a single assembly handled as one part. Hoop expansion of the washer by the nut downward thrust results in a spring action which permits the nut to be deflected at a high spring load with relatively small deflection. The spring load is equivalent to the safe load of the bolt.

Brown-Fayro, Sanford-Day Merge

Sanford-Day Iron Works, Knoxville, Tenn., has purchased the assets of The Brown-Fayro Co. which will be merged with the parent company and operated as the Brown-Fayro Division of Sanford-Day Iron Works. Sanford-Day's new division is located at Johnstown, Pa.

Announcement of the merger was made jointly by officials of the two well known mine equipment manufacturers. "The merger enables both companies to offer coal, metal and nonmetallic mines a more complete line of equipment," the joint announcement said. C. O. Crump, president of Brown-Fayro, continues as manager of the Brown-Fayro Division of Sanford-Day.

Get Light On the Subject

A new aluminum floodlight has been announced by the General Electric Co.'s Lighting and Rectifier Department.

Designated the L-66, the unit is equipped with ribbed trunnion bracket that permits 360° vertical or hori-

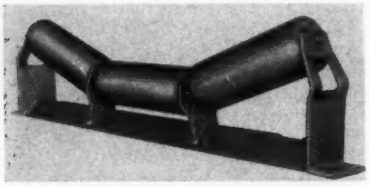


zontal rotation, the floodlight utilizes a 200-w general service lamp that throws a 946-cp beam.

Features include a heat- and weather-resistant glass lens, snap-ring clamping band for convenient lamp access, porcelain-based socket that maintains proper lamp focus, and knockouts in base to permit mounting on 3¼- and 4-in. outlet boxes.

Belt Conveyor Carrier

A belt conveyor carrier incorporating a number of unique design features typical of more expensive units has been introduced by Stephens-Adamson Mfg. Co. Four-in. diameter rollers have spun ends and turn on precision



ball bearings. Die cast, non-corroding, labyrinth seals protect bearings. Alemite fittings are provided for relubrication if desired. However, sufficient grease is contained in the bearing chamber to operate carrier rolls on a "lubricated for life" basis, according to the company.

Formed steel brackets and inverted angle base are designed to prevent build-up of dust and dirt. Carrier rolls are interchangeable and can be inserted or removed from brackets without tools. A special lubrication kit is available to make all lubrication from one side of carrier possible.

The SP-1745 carrier is available for stock shipment in sizes for 18, 24, 30 and 36-in. belts from Standard Products Division, Stephens-Adamson Mfg. Co., Aurora, Ill.

Design Strong Belt

A new super strength conveyor belt which makes it possible to haul thousands of tons of coal per hour on one continuous belt a distance of three miles underground has been developed by United States Rubber Co.

The new belt called Super Ustex-Nylon, was introduced at the annual coal meeting of the American Mining Congress by Ernest G. Brown, vice-president and general manager of the company's mechanical goods division.

The belt utilizes a new type of cellulosic yarn which is treated chemically to give it exceptional strength. The only belt carcass material in its strength range is steel cord. Its big advantage over steel cord, however, is that it cannot rust or corrode.

In main haulage underground coal conveyor systems, one of the new belts 42 in. wide could carry coal at a continuous rate of 1000 tph at a speed of 600 fpm for a distance of three miles without transfer.

On a 42-in. wide slope conveyor hauling 1000 tons of coal per hour from the bottom of the mine to the surface of the ground, the belt will permit vertical lifts in excess of 800 ft. It would be entirely possible to construct a slope belt conveyor utilizing a 72-in. Super Ustex-Nylon belt requiring a 2500-hp drive.

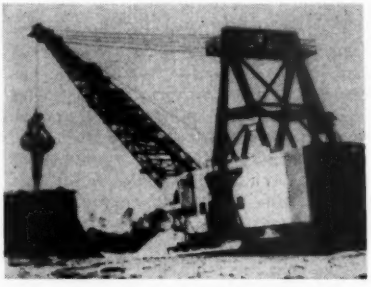
TL-12 Tracto-Loader

A four-wheel drive rubber-tired loader with a one cu yd bucket is announced by Tractomotive Corp., Deerfield, Ill. It is the model TL-12 Tracto-Loader, equipped with rear wheel power steering, a clutch type transmission with four speeds in each direction, and a torque converter drive with a three-to-one torque multiplication ratio.

Largest Clamshell

A Marion clamshell, believed to be the world's largest on a long boom, went into service in February in Florida at the Bunnell Plant of the Lehigh Portland Cement Co. near Daytona Beach.

A 9½ cu yd clamshell swings from the end of a 175-ft boom on a Marion 7400 Walking Dragline, handling a mixture of sand and coquina shell used



by Lehigh as raw material for the production of Portland Cement.

The Marion is teamed with a 10-yd dragline and a screening plant to separate the coquina component from the excess sand.

Giant clamshells are not new to industry, for many are used on overhead cranes to load and unload ships. But the 9½ cu yd Marion is believed to establish a record in size for use on long booms.

"See-Thru" Cabinets

General Industrial Co. of Chicago has announced the addition of a new line of portable cabinets to their "See-Thru" small parts drawer cabinets. According to the manufacturer, equipment, supplies and small parts can be neatly filed in the clear front plastic drawers and then carried conveniently to the job. The drawers are protected by a welded all-steel cabinet, tested to carry a 100-lb load safely. Each of the 24 plastic drawers in the cabinet is 1 7/16 in. high by 2¾ in. wide and 5⅞ in. deep. In addition there is a steel drawer 3⅛ in. high by 11½ in. wide and 5⅞ in. deep. Dividers for the plastic drawers provide 72 adjustable compartments. General Industrial Co., 5738 Elston Ave., Chicago 30, Ill., will be pleased to furnish literature and additional information on request.

Conveyor Brakes

Two engineers of Hewitt-Robins, Incorporated, have devised a new method of braking the descent of downhill conveyors on hilly or irregular terrain by the use of an automatic clutch mechanism which prevents the belt from running downgrade beyond its designed speed.

The mechanism utilizes a single motor attached to a drive pulley and a holdback pulley, each equipped with a one-way clutch. When power is required to drive the conveyor uphill or over level ground, the drive pulley is automatically engaged and the holdback pulley remains free wheeling. When the conveyor starts downhill, the holdback pulley takes over from the drive pulley and regulates the belt's descent.

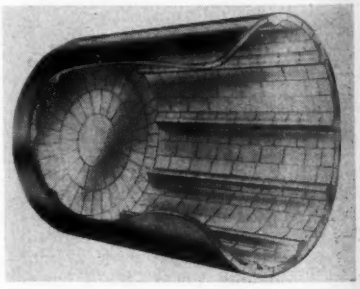
This control relieves strain on the conveyor system and permits the use of lighter, more economical belts than would be permissible with the conventional type of drive.

The inventors are Reinhardt Petterson, a member of Hewitt-Robins' engineering organization in New York, and Leslie G. Weygandt, field engineer at Philadelphia.

Mill Lining

Coors Porcelain Co., Golden, Colo., has just announced the availability of their new High Density Mill Lining and Tank Lining Brick. This new product is made of alumina ceramic. The company reports that in one test with a lined paint plant pebble mill, a maximum wear of only 3/8 in. was measured after over 17,000 hr. Present estimates put the estimated service life of this two-in. lining at about 70,000 hr.

The Ceramic is resistant to attack from all acids except hydrofluoric, and



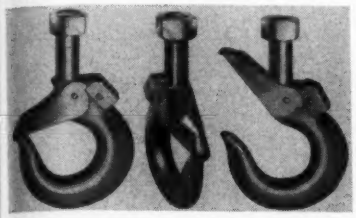
from strong caustic solutions, especially under high temperature conditions.

Some of the engineering features are: double size shell brick, new radial head brick design, integral lifter bars, made of service tested ceramic used in manufacture of Coors Grinding Media. Brick are made to size for easier, cheaper installation.

Additional information and prices may be obtained by writing LZP Industrial Ceramics, 2500 West 7th Ave., Denver 4, Colo.

New Type Safety Hook

Many advantages are claimed for a new Safety Hook that has been developed by Coffing Hoist Co., Danville, Ill. It is said not only to offer greater safety to both men and equipment during lifting operations, but is also



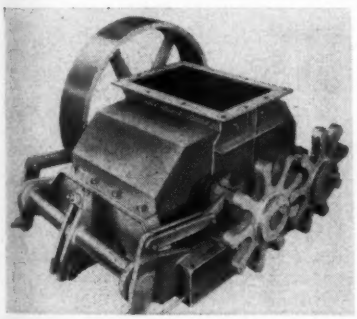
simple and convenient enough so that hoist operators will make full use of its safety locking feature.

Once the hook is engaged, a stamped steel latch swings down and is securely held in place by a lock under spring tension. There can be no movement of the latch sideways because it fits snugly over the point of the hook. Slight pressure on the release unlocks the latch, and spring tension on the release holds the latch open.

Show New Crusher

The McLanahan Black Diamond Double-Roll Crusher—a crusher for the reduction of coal, lime, cinders and other materials of similar crushability—has been developed by McLanahan and Stone Corp.

Various sizes of the unit are available for processing a range of feed sizes. Roll diameters are 18, 24, 30



and 36 in., with roll lengths from 18 to 60 in.

Construction features a movable roll, backed by a unique linkage system, which incorporates a curved cast iron adjusting block. This serves as a combination tramp iron protection and adjustment device. These blocks, which are made in various lengths to permit different product size openings, are designed to break upon entry of tramp iron or other non-crushable material into the crusher.

Additional details on the McLanahan Black Diamond Double-Roll Crusher may be obtained from McLanahan and Stone Corp., Hollidaysburg, Pa.

— *Announcements* —

David L. Springston has been appointed sales engineer for the **Wemco Division of Western Machinery Co.** Springston will be headquartered at Columbus, Ohio.

Pennsylvania Crusher Co. has moved their offices from Philadelphia, where they have resided for nearly 50 years, to their own building in nearby West Chester, Pa. The test crush laboratory is also being moved from Norristown, Pa., to the new quarters.

Denver Equipment Co. announces a new address for their El Paso office. The office is now located at 201 West 7th St., El Paso, Tex.

International Selling Corp. of New York has been appointed exclusive distributor of the Bamfords slow-speed diesel engines in the United States, Canada and Mexico, it was announced recently by Bamfords, Ltd., of Uttoxeter, England.

The **Dorr Co.** announces the opening of a new office on June first at 204½ Chestnut Ave., Virginia, Minn., to better serve the iron mining industry of Minnesota and Michigan.

American Brake Shoe Co. announces the opening of a new sales and technical service office in Duluth, Minn., to serve the various mining companies in that area.

W. Harvey Thompson has been named assistant to the executive vice-president of **H. K. Porter Co., Inc.**, according to an announcement by T. M. Evans, the concern's president.

The American Zinc, Lead and Smelting Co. announces that the Board of Directors of the **American Zinc Sales Co.** and **American Zinc Oxide Co.**, both wholly-owned subsidiaries, have elected **Howard Lee Young** a vice-president of both companies.

Heyl & Patterson, Inc., Pittsburgh, has announced two personnel changes. **J. A. (Drew) Farnsworth** has been named contracting engineer of the company, and **James P. Blair** has been named assistant chief engineer of the Light Equipment Engineering Division.

C. W. Schweers, vice-president and director of sales of **Allis-Chalmers** general machinery division has announced the following appointments to his staff: **O. V. Tally**, director of industrial sales; **J. S. Morgan**, director of utility sales, and **W. L. Manly**, director of general purpose equipment sales. In addition, **J. F. Roberts**, vice-president and director of engineering of the general machinery division, has announced the appointment of **R. C. Allen** as director of mechanical engineering, and of **L. J. Linde** as director of electrical engineering for the division.

Formation of the **Harco Co.** for the sale of heavy construction and mining equipment in the Rocky Mountain area has been announced. The company will represent Joy Manufacturing Co. and will sell wire cable, Ford tractors and other industrial supplies. Sales offices will be at 1340 S. Lipan St., Denver, Colo.

CATALOGS AND BULLETINS

MANGANESE STEEL CASTINGS. *American Manganese Steel Division, 389 East 14th St., Chicago Heights, Ill.* A general catalog describing the complete line of castings made of manganese steel. A complete discussion of the impact and abrasion resistant characteristics of Amsco 13 percent manganese steel. Detailed information on power shovel dippers, teeth, chain, gears, sheaves, crusher parts, dredge and materials handling pumps.

MINING AND QUARRYING STEELS. *Bethlehem Pacific Coast Steel Corp., 20th & Illinois Sts., San Francisco, Calif.* The booklet "Bethlehem Mining and Quarrying Steels" describes specialty steels for use in the mining industry. Recommendations for the forging and heat-treatment of these steels are also included. Copies of the booklet may be obtained by writing any of Bethlehem Pacific's Sales offices in Seattle, Spokane, Portland, San Francisco and Los Angeles.

PREFABRICATED THAWING PITS. *Hauck Manufacturing Co., 124-136 Tenth St., Brooklyn 15, N. Y.* Bulletin No. 1041 describes thawing frozen railroad hopper cars of coal, limestone, ores, etc., with radiant heat. Bulletin will be sent on request to the above address.

RUST-OLEUM RUST PREVENTIVES. *Rust-Oleum Corp., 2799 Oakton St., Evanston, Ill.* A general catalog describing rust prevention methods with Rust-Oleum products. It includes 94 color chips and complete instructions for surface preparation and application of the various paints. Ask for Catalog, Form No. 253.

SPRAY NOZZLES. *Spraying Systems Co., 3201 Randolph St., Bellwood, Ill.* A 48-page reference catalog describing all kinds of special industrial spray nozzles. Complete data is listed covering capacity and spray angle of each nozzle. Tables are included on spray coverage and pipe frictions. Ask for Catalog No. 24.

SWITCHGEAR. *I-T-E Circuit Breaker Co., Philadelphia 30, Pa.* Bulletin 7004B describes the company's metal-clad "Multumite" switchgear.

WOBBLE-ROD AIR VALVE. *Pantex Manufacturing Corp., P. O. Box 660, Pawtucket, R. I.* An engineering bulletin describing in detail the wobble-rod air valve for on-off control with pneumatic systems. Bulletin No. 61861 evaluates six unique features of the valve and illustrates application ideas.

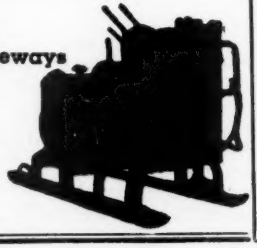
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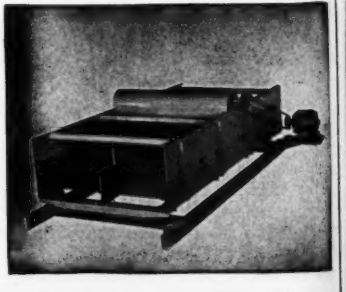
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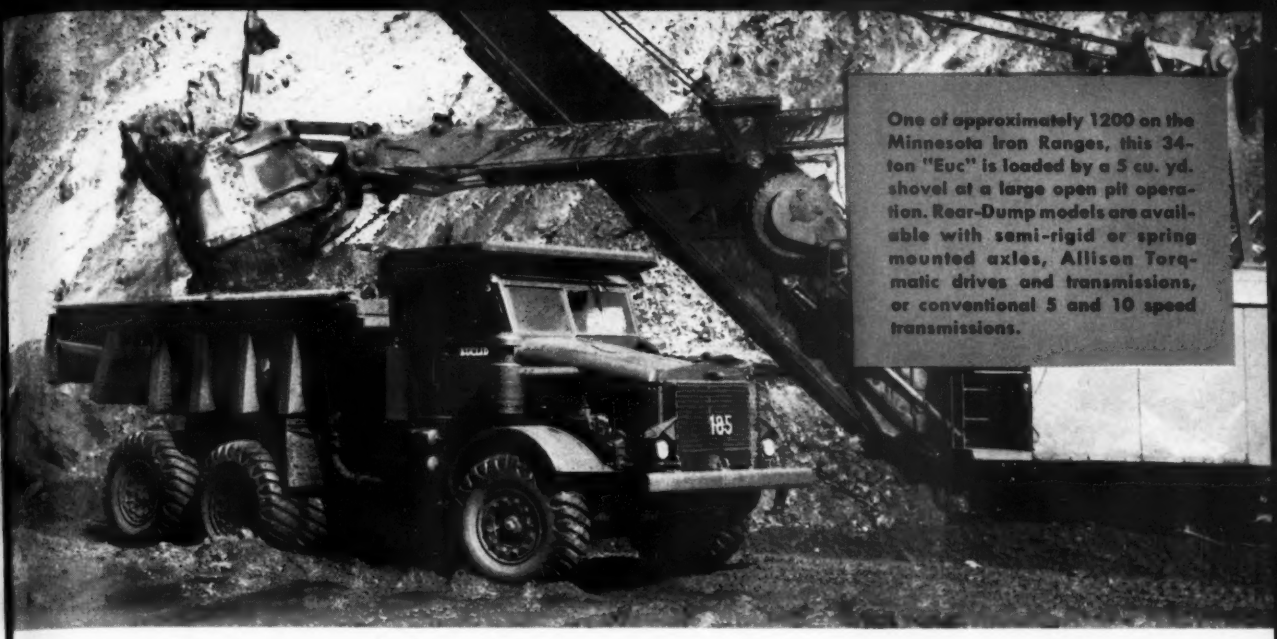
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One of approximately 1200 on the Minnesota Iron Ranges, this 34-ton "Euc" is loaded by a 5 cu. yd. shovel at a large open pit operation. Rear-Dump models are available with semi-rigid or spring mounted axles, Allison Torqmatic drives and transmissions, or conventional 5 and 10 speed transmissions.

More Profit with "Eucs" in Mines and Quarries

■ Built for tough off-the-highway service, Rear-Dump and Bottom-Dump "Eucs" and Euclid Scrapers are cutting the cost of moving ore and overburden, sand and gravel, and stone on quarry and mining operations. Big payload capacity, fast travel speed and high job availability add up to more loads per hour and lower cost per ton or yard hauled.

■ Your Euclid Distributor will provide a hauling production and cost estimate for your operation . . . there's no obligation so get in touch with him soon. Have him show you how Euclid equipment can improve your profit picture.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio



This Bottom-Dump "Euc" is being loaded with 17 cu. yds. of sand and gravel from an overhead hopper for haul to the washing plant. Owner is Interstate Sand and Gravel of Covington, Ohio.



Ideal Cement Co. of Portland, Colorado uses 22-ton Rear-Dumps with quarry bodies to haul stone from the face to the crusher. Top speed of this Model 36 TD, with full payload, is 32.5 m.p.h. Spring mounted drive axle and Allison Torqmatic drive and transmission are important factors in stepping up production and profits at this quarry operation.



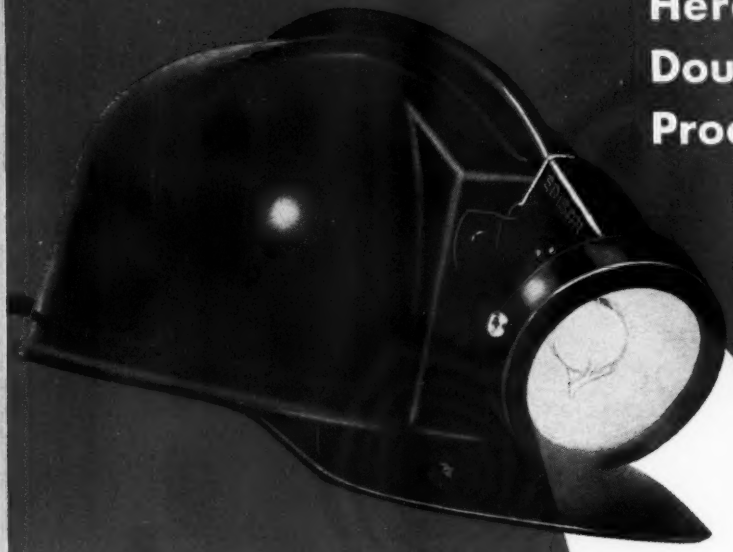
Euclid Twin-Power Scraper stripping overburden at a large gypsum quarry in Iowa. Powered by two 190 or 200 h.p. engines with torque converters and semi-automatic transmissions, this "Euc" self loads, has a struck capacity of 18 cu. yds. and travels up to 30 m.p.h. with full payload.

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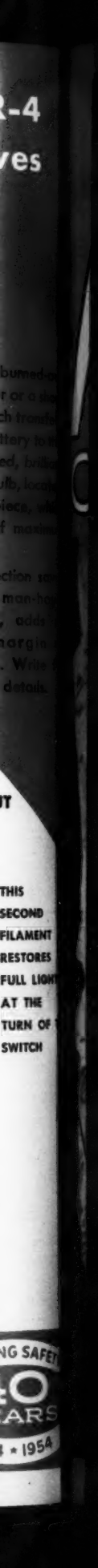
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